

May 9, 1867.

George Busk, Esq., F.R.S., V.P., in the Chair.

The Secretary called the attention of the Meeting to the following interesting additions to the Society's Menagerie :—

1. An example of the Parrot (*Coracopsis barklyi*) described by Mr. Edward Newton at the last Meeting of the Society, from Praslin Island, Seychelles; presented to the Society by Swinburne Ward, Esq., H.M. Commissioner to the Seychelles, on the 8th ult.

2. A Tortoise from Digué Island, Seychelles (*Sternotherus subniger*, Gray, P. Z. S. 1863, p. 195); presented by the same gentleman on the 23rd of March last.

3. A pair of Ka Ka Parrots (*Nestor hypopolius*), from New Zealand; presented to the Society by the Acclimatation Society of Canterbury, New Zealand, on the 25th of April.

4. A Boatbill (*Cancroma cochlearia*), obtained in exchange from the Zoological Gardens, Antwerp, on the 25th of April.

5. A male Ground-Hornbill, from West Africa (*Bucorax abyssinicus*); presented May 6th by C. B. Mosse, Esq., Staff-Surgeon; and very acceptable, as the Society's collection had previously contained three females of this rare and interesting species.

Mr. Selater exhibited a skull of *Tapirus bairdi*, which had been forwarded to him by Capt. J. M. Dow, C.M.Z.S. This skull had been obtained on the side of the Volcan Viejo in Nicaragua, and was of great interest in proving that this species of Tapir extended its range northwards so far. Mr. Selater also remarked that it would be of still greater interest now to ascertain to what species the Mexican Tapir was referable, it being well ascertained that a species of this genus occurs in the southern parts of Mexico*.

A letter was read from Dr. G. Bennett, F.Z.S., dated Sydney, February 21st, and addressed to the Secretary, in which details were given respecting the rediscovery of *Casuaris australis* in Queensland, and photographs were enclosed of a specimen of this bird recently received by the Sydney Museum.

Dr. Bennett's communication enclosed a copy of the following letter, addressed to the Editor of the 'Sydney Herald' by Mr. W. Carron, the only survivor of Kennedy's Expedition, during which the original example of *Casuaris australis* had been procured :—

"Botanic Gardens, Sydney,
8th February, 1867.

"SIR,—In the 'Herald' of to-day is a letter from Mr. G. Krefft

* "Our Museum" (*i. e.* that of Copenhagen) "possesses a very bad and much mutilated skin (without any bones) of a Tapir from Mexico (Oaxaca), brought back in 1843 by the late botanist Prof. Liebmann. It is indeed too bad to found any decisive opinion upon it; but I cannot find any difference between it and the common American Tapir (*Tapirus americanus*)."—Prof. REINHARDT, *in litt.*

of the Sydney Museum, giving the description of a Cassowary lately obtained by Mr. G. Randall Johnson at Rockingham Bay, and also alluding to one shot by Mr. Thomas Wall while on the expedition to Cape York with the late Mr. E. B. Kennedy.

"I have just seen the bird sent to the Museum by Mr. Johnson, and think it is identical with that shot by Mr. Wall in the vicinity of Weymouth Bay in November 1848; but the description given of the latter as quoted from Gould's work on 'Australian Birds' is not correct. I am aware that in the few remarks on Wall's bird, which appear in my narrative of Kennedy's expedition, there is an error as to the colour of its helmet or comb, which was *black*, not *red* (the redness referred to the wattles), an error which I have before corrected. As I was present when Wall's bird was shot, and helped to eat it, I had a good opportunity of knowing something about it. Instead of going in flocks of five or six together, it is certainly a solitary bird, and would appear to be very scarce, as only two others were seen by our party during the whole journey from Rockingham Bay to my furthest camp at Weymouth Bay, in latitude $12^{\circ} 25' S$. This bird had shorter but larger legs, a heavier body, and shorter neck than the Emu, the colour very dark, its habits, too, being unlike those of the Emu. It appears to confine itself to the gullies in the thick jungles with the Brush-Turkeys and Jungle-fowl, feeding on the various fruits found there, even swallowing the large seeds of *Castanospermum* and *Pandanus*. Mr. Wall took every care of the skin he was able to do; but it was completely destroyed before he died, together with my own specimens at Weymouth Bay. This bird was certainly very large, and furnished our whole party with a better supper and breakfast than we had enjoyed for some months, or than poor Wall was destined to enjoy again (as he and all his companions, with the exception of myself and one other, had died in six weeks after from want of food); but there was not one in the party who would not have eaten more if he could have got it, every meal being divided with the greatest nicety, and having been so for a long time.

"I am, Sir, yours, &c.,

"W. CARRON."

A letter was read, addressed to Professor Owen by Sir Walter Elliot, K.S.I., F.Z.S., and communicated to the Society by Prof. Owen, containing some corrections of notes contributed by Sir Walter Elliot to paper recently contributed by Prof. Owen to the Society's 'Transactions'*.

'This letter will be published entire in the Society's 'Transactions.'

Mr. E. Blyth, C.M.Z.S., exhibited a skin of a Quail shot near Missouree, new to the fauna of Continental India. This species had been described and figured in the 'Knowsley Menagerie,' pt. 2, as *Rollulus superciliosus*; but Mr. Blyth considered that it belonged

* "On some Indian Cetacea collected by Walter Elliot, Esq." By Professor Owen, F.R.S., F.Z.S., &c. (Trans. Zool. Soc. vi. p. 17).

more strictly to the true Quails, and should be made the type of a new genus proposed to be called *Malacoturnix*.

A communication was read from Dr. A. Leith Adams, containing a description of a new fossil Dormouse from the quaternary formations of Malta, proposed to be called *Myoxus melitensis*.

This paper will be published in the Society's 'Transactions.'

Dr. J. Murie read a memoir on the dermal and visceral structures of the Kagu (*Rhinochetus jubatus*), Sun-bittern (*Eurypyga helias*), and Boatbill (*Cancroma cochlearia*), as observed in specimens of these birds recently deceased in the Society's Gardens.

This paper will be published in the Society's 'Transactions.'

The following papers were read :—

1. On the Passage of the Young to the Pouch in the Kangaroos (*Macropus* and *Halmaturus*). By E. S. HILL. Communicated, with Remarks, by Prof. OWEN, F.R.S., F.Z.S., &c.

[I have been favoured by an esteemed correspondent with the following letter, which, from past experience of his accuracy of observation, I confidently communicate as a document of genuine scientific value, in elucidation of the interesting problem in animal-generation to which it relates.

I am not aware that the phenomena of the transport of the young to the pouch have been previously observed in Kangaroos in their native wilds; at least I know of no record of such observations. What physiology has hitherto taught on this subject has been based on experiments on Kangaroos in captivity made a few hours after the uterine fœtus had become a mammary one, and on the single observation by the Knowsley superintendent of the parturition of a captive Potoroo (*Bettongia*), recorded by the late Earl of Derby in the 'Proceedings' of this Society for November 12th, 1844.—R. O.]

" Woollahra, Sydney,
23rd January, 1867.

" Recently I visited the caverns (breccia caves of Wellington Valley) discovered by Sir T. L. Mitchell, our once Surveyor General, situated about 280 miles from Sydney, for the purpose of reporting whether it would be desirable to have a collection from that quarter. Mr. Krefft, of our Museum, was sent, and what bones he got will figure at the Paris Exhibition. Winter is the proper time to work there, and not less than two months for the purpose.

" At the risk of being tedious, I am about to mention a fact which occurred at the early part of last winter, one which may never occur to me again, and which in all probability has not occurred before under observation.

"Many people in this country still entertain the popular tale that the young of the Kangaroo is formed and grows on the teat, and cheat themselves into the belief that it is a truth. Others more industrious still disseminate the tales of stock-men, who broadly assert that they have watched the development, and have killed hundreds of adults with the young in that state. Backed by the fact that these young bled at the mouth when forced from the teat, it is very easy to swell the ranks of believers in these popular notions, but difficult to get any one to search out the truth or to alter their expressed opinions.

"Hunting on the mountains at the time referred to, about 100 miles from Sydney, for the double purpose of getting specimens of the Wallaroo (*Macropus robustus*) for our Museum, and entertaining a couple of friends in the sport, I was quietly ensconced under shelter of some rocks, waiting for any game which might be disturbed from the back country by my aborigines, who were sent around for that purpose as soon as we had taken up our proper position to receive any coming within range. I had not been placed half an hour before I heard the well-known sounds of game, and immediately afterwards saw in the van a fine doe Wallaroo, followed at some distance by half a dozen others of both sexes.

"I was perfectly secure, and down wind, and almost sure to get a shot, but desired to have a large black male, which I saw among the troop. So soon, however, as the doe came within 30 yards she sat up for a moment, then squatted and put her head towards the ground, and picked up, as I thought, a piece of stone with her lips; in an instant, with her hands back to back, she seized her pouch, stretched it open and inserted her head, ears and all, to the very neck, in which position she remained half a minute, then, withdrawing her head and looking all round (the companions had halted in the distance at the same time as herself) and seeing all safe, put her head in again as before. Suddenly there was a move among the lot, and to all appearance they were for another direction. I at once shot the doe, examined the pouch, and found that her care and solicitation had been bestowed on the young, just born, which had been conveyed to the pouch by her lips.

"That, however, was not conclusive to one of my friends. In the grey of the following morning, not far from our camp, very quietly on a ledge of rocks sat a Wallaby (*Halmaturus*) engaged at her pouch: it was shot; the young evidently had only just been conveyed there, and had not hold of the nipple. In the course of the day fourteen others were added to our bag, two females of which I dissected and found a young one, or fœtus, in each. This was conclusive.

"Believe me,

"Very faithfully yours,

(Signed)

"E. S. HILL."

[If reference be made to the 'Proceedings' of our Society for November 26th, 1833 (vol. i. p. 132), the conclusions from the experiments on *Macropus major* there recorded were "that parturition

takes place in the erect and not in the recumbent posture," "that the fore paws were not used for the transmission of the fœtus, but to keep open the pouch ready for its reception, while the mouth would be the means by which it would be deposited therein, and, perhaps, held over a nipple until the mother felt the sensitive extremity grasped by the young one." I was led, also, to suggest, from "the ease with which the mother could reach with her mouth the orifices of the vagina and pouch," that the young might be so transferred from the one to the other.

The superintendent of Lord Derby's menagerie, however, reported that the '*Bettongia*,' "backing as it were into a corner of her cage, in this situation produced the young one, which, after its birth, she took up in her fore paws and deposited in the pouch."

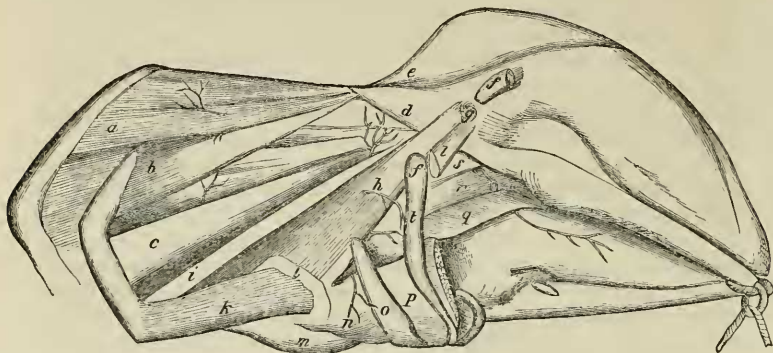
Mr. Hill's observations, in which I am disposed to place more confidence, distinctly testifies to the lips or mouth as the instrument of transport, the fore paws aiding precisely in the manner observed in my experiments. The Knowsley observation accords with Mr. Hill's in the circumstance of the fœtus being dropped on the ground when expelled from the vagina: as may be inferred, at least, from the expression that "after its birth she took it up and deposited it in the pouch" (Proc. Zool. Soc. 1844, p. 163). Whether this circumstance of the parturition is constant, viz. the dropping of the fœtus on the ground, or whether the fœtus may, occasionally, be received by the mouth from the vulva, I am still disposed to regard as a matter for ulterior observations. But the main fact of the conveyance of the fœtus to the pouch by means of the mouth may now be held as the more probable (at least the more usual, if not the constant) way in the genus *Macropus*.—R. O.]

2. On some Points in the Anatomy of *Globiocephalus svineval* (Gray). By ALEXANDER MACALISTER, M.D., Demonstrator of Anatomy, Royal College of Surgeons, Ireland.

Through the kindness of Dr. Carte, Director of the Natural History Museum of the Royal Dublin Society, I have had the opportunity of dissecting some parts of a Cetacean belonging to the above species, and in its structure I have found what I think are peculiarities worthy of record. The individual was a very young one, caught on the west coast of Ireland, near Ballina, north-west of co. Mayo, and when recent measured nearly 6 feet in length. The skeleton was but imperfectly ossified, the lateral and spinous processes of the vertebræ being yet cartilaginous and flexible for the most part. Most of the soft parts had been removed before the specimen was sent up to Dublin; but the pharyngeal and laryngeal apparatus was untouched, as likewise were the anterior extremity and a few of the spinal muscles; it was of these few parts that I was enabled to make a careful examination. (In the accompanying woodcut (p. 478) the

head is rotated a little, so that the under surface of the lower jaw is turned forwards; and the tongue is removed; the latter was gone before the animal was submitted to my notice.)

The observations which I have subjoined may be grouped into three series: 1st, regarding the anatomy of the pharynx and larynx; 2ndly, regarding the spinal muscles; and 3rdly, regarding the structures forming the anterior extremity.



Globiocephalus svineal.

- a. Scalenus posticus. b. Scalenus medius. c. Scalenus anticus. d. Trachelomastoid. e. Rectus capitis posticus major. f, f. Stylo-keraticus. g. Squamo-keratic joint. h. Stylo-pharyngeus. i. Carotid artery. k. Sterno-thyroid. l. Thyroid cartilage. m. Front of same. n. Thyro-hyoid. o. Posterior cornu of hyoid bone. p. Hyo-keratic. q. Superior constrictor. r. Pterygo-keratic. s. Superior constrictor. t. Stylo-hyoid.

The anatomy of the pharynx differs in many respects from that of *Balanoptera rostrata*, and likewise from that of *Delphinus* and *Phocæna*; in general, however, its modes of arrangement are more closely allied to those of the latter species than to those of the former.

The pharynx is a wide ovoid bag with a large anterior opening communicating with the mouth, from which, however, it was separated by a thick round crescentic fold, which bounded the isthmus faucium upon three sides, and was attached to the base of the tongue below by the extremities of its cornua. This fold was smooth, but showed no trace of a uvula in its centre; but on dissecting from its surface the mucous membrane, a thick sphincter isthmi faucium or palato-glossus muscle was brought into view. This muscle, in common with its fellow of the opposite side, arose from the middle line of the velum pendulum palati, and was inserted into the side of the base of the tongue; this muscle, when it acted, was capable of occluding perfectly the oral aperture of the pharynx, a condition of probable occurrence in the respiratory actions.

The openings of the posterior nares passed upwards and forwards from the pharyngeal cavity above and behind the opening into the mouth; these apertures were separated from each other by a septum, which did not extend as far backwards as the lateral boundaries of

the canal; so the tube was single at its pharyngeal end for a short distance; its mucous walls were thick and slightly moveable, having a muscular ring subjacent to the lining membrane. This sphincter-like arrangement arose from the median ridge of the basisphenoid, and surrounded the aperture of the nares; from its position it was evidently a displaced representative of the levator palati muscle; here, however, it is developed as a constrictor naris. Below, the pharynx contained the tubular prolongation of the glottis, which in this species resembled that of the Porpoise in the cohesion of its sides, as the aryteno-epiglottidean folds were prolonged nearly to the extremities of the arytenoid bodies and of the epiglottis; these folds contained the aryteno-epiglottic muscles. In *Balaenoptera* the glottis differs remarkably in being arranged in a freer manner, as two-thirds of the prominent portions of the arytenoids and epiglottis are perfectly unattached to each other.

The opening of the œsophagus was marked by a sudden constriction, and was placed below the level of the cricoid cartilage, which was deficient anteriorly.

The pharyngeal mucous membrane being removed, the three constrictors were exposed, arranged nearly in their usual manner. The inferior had its origin from the posterior margin of the cricoid and thyroid cartilages, and was inserted into the median raphe; below it were the inferior laryngeal nerves; and in shape it was quadri-lateral and very narrow. The middle constrictor was rather thicker and somewhat triangular; it arose from the posterior cornu of the hyoid bone and by some fibres from the stylo-hyoid cornu (the latter corresponding to the occasional syndesmo-pharyngeus of some animals, and rarely of man); its fibres ran backwards, expanding, and were inserted into the median raphe, where they were wide and thin and overlapped by the last described.

The superior constrictor, whose fibres were closely connected to those of the palato-pharyngeus, formed a thick stratum surrounding the anterior extremity of the pharynx; it arose from the inner surface of the internal pterygoid plate, extending into the posterior nasal orifice to a distance of 3 inches from the pharyngeal level of that opening; its fibres likewise arose from the posterior border of the palatine bone and from a dense fascia, corresponding to an inwardly displaced intermaxillary ligament, which extends from the angle of the maxilla to the edge of the stylo-hyoid cornu; from these origins the fibres ran downwards, inwards, and backwards to be inserted into the raphe. The most internal fibres were continued over the others, and on a plane superficial to the middle and even to the inferior constrictor; these, though in this instance inseparable from the rest of the mass, yet, from the nature of their insertion, I would judge to be the representative of the muscle not infrequent in some animals, and called by Meckel azygos pharyngis. This muscle sometimes occurs as an irregularity in human anatomy (Proceedings of the Royal Irish Academy, vol. ix. pl. 5. f. 1a).

Within the constrictors, although there was no distinct posterior faucial pillar in relation to the soft palate, yet there was a strong

broad palato-pharyngeus muscle, which arose from the posterior border of the palate bones opposite the median line of the velum and above and behind the palato-glossus; from this point the muscles of both sides diverged, and, passing beneath or on the inner aspect of the superior constrictor, were inserted into the vertebral edge of the thyroid cartilage. There was no trace of a tonsil; nor anteriorly could any rudiment of a salivary gland be found, even though I searched in the locality corresponding to the place where Dr. Carte and I found a rudimental parotid in *Balenoptera rostrata*.

In the dissection of the neck I found the following muscles connected with the hyoid bone and larynx :—1. Sterno-hyoid, arose from the upper edge of the sternum and ran to the body of the hyoid bone. 2. Sterno-thyroid, from the back of the sternal extremity of the cartilage of the first rib to an angular line on the thyroid cartilage; in direction it ran upwards and inwards, and it overlapped the common carotid artery. This muscle was not found by Dr. Carte and myself in *Balenoptera*; its costal origin is interesting, as a corresponding attachment is sometimes its sole origin in Man, as described by Hallett and others. 3. Thyro-hyoid, from above the oblique line on the ala of the thyroid cartilage to the posterior border of the base of the os hyoides. 4. Crico-thyroid, quadrilateral in shape, entirely covered by the sterno-thyroid, passed from the front of the cricoid cartilage upwards and forwards* to the posterior edge of the thyroid. 5. Hyo-keratic (κέρας, cornu), probably a modified hyo-glossus, arose from the anterior edge of the body of the hyoid bone, and was inserted into the hinder and upper edges of the stylo-hyoid cornu; this muscle was short, broad, and thick. 6. Stylo-keratic, arose from the squamous bones, external to the articulation between the stylo-hyoid cornu and the base of the skull; from this point it ran downwards and backwards to be inserted into the upper third of the stylo-hyoidean cornu. 7. Stylo-hyoid, a pyriform muscle remote from the last named, arose from the squamous bone internal to the afore-mentioned articulation, and was inserted into the posterior or great cornu of the hyoid bone; its origin was placed on a plane in front of the next muscle, stylo-pharyngeus; its belly crossed over the stylo-hyoid bone, and its tendinous insertion crossed the external carotid artery and the lingual nerve. 8. Stylo-pharyngeus, arose from that portion of the squamous bone behind the styloid articulation, posterior to the last described, and was inserted into the superior edge of the thyroid cartilage, upon which there was an oblique ridge for its insertion. This muscle was narrow at its origin, and overlapped in its course the glosso-pharyngeal nerve, internal and external carotid arteries, and the rete mirabile formed by the former vessel; its insertion was superficial to the middle constrictor of the pharynx, and was separated from the attachment of the sterno-thyroid by a small part of the origin of the thyro-hyoid muscle. For these muscles I have preserved the name stylo, although they have in reality no true styloid attachment. 9. Basio-thyro-hyoid, arose

* All these positions have reference to the animal as placed resting on its ventral aspect.

tendinous from the basilar process of the occipital bone, and ran backwards to be inserted into the posterior border of the thyroid cartilage, the thyro-hyoid membrane, and the posterior cornu of the hyoid bone. This muscle underlay the last named, with which it was partly continuous; it seemed to be an expanded representative of the cephalo-pharyngeus of Theile (figured as a human muscle in the Proc. R. I. A. vol. ix. pl. 6. f. 16).

Relating to the actions of these muscles, there are many points very well worthy of note; but I refrain from making any observations at present on the subject, as they will be detailed at length by Dr. Carte and myself on a future occasion in connexion with the anatomy of *Balenoptera rostrata*.

The muscles of the spine which remained in the specimen were:—1. Depressor caudæ. 2. A fragment of levator caudæ. 3. A small part of latissimus dorsi; besides the following:—4. Scalenus anticus, from the first rib to the front of the transverse processes of the upper cervical vertebra. 5. Scalenus medius and posticus conjoined, from the first and second ribs to the upper cervical transverse and spinous processes; the portion attached to the latter was probably the germ of the serratus posticus superior, which otherwise was not visible. 6. Trachelo-mastoid, from the transverse process of the first cervical vertebra to the external side of the occipital bone at the junction of the exoccipital and paramastoid elements. 7. Rectus capitis posticus, from posterior part of the atlas to the hinder edge of the foramen magnum and occipital bone above that level. 8. Rectus capitis anticus, from the front of the bodies of the cervical vertebræ to the basilar process of the occipital bone.

There were some points of interest in the dissection of the paddle or fore limb. On removing its thick greyish-black integument, all the bony elements of the typical anterior extremity were found in it, although some, as the carpus, metacarpus, and phalanges, were purely cartilaginous; consequently the exact number of the latter could not be distinctly reckoned. The dorso-scapular group of muscles had been removed before the subject was examined; but traces of a deltoid supraspinatus and infraspinatus existed, though there was no sign of a teres minor or teres major, which are present in Dolphins.

The subscapularis, which was attached as usual to the subscapular fossa and inner side of the head of the humerus, was completely intersected by eight tendinous planes slightly radiating towards the posterior edge: this point is of interest, as in *Balenoptera rostrata* there is hardly any sign of these intersections, otherwise so uniformly found in so many animals. This muscle does not pierce the capsule of the shoulder, nor is there a bursa beneath its tendon.

The coraco-brachialis was short and fleshy, arising from the front of the coracoid process, whence it passed to be inserted into the capsule of the shoulder and into the front of the neck of the humerus. This corresponds to the short variety of this muscle described by many anatomists, noticed by Mr. Wood and others as an occasional occurrence in Man (Journal of Anat. & Phys. vol. i. p. 47. f. 2).

I have seen it in Man, *Cebus capucinus*, *Ateles*, *Cercopithecus*, *Macacus*, Horse, Seal (although Meckel denies its existence in the latter animal); and it has been noticed by others in the Dog, Cat, Ichneumon, Marmot, *Ornithorhynchus*, Deer, Porpoise, &c. (for references *vide* Wood, *loc. cit.* p. 51). The chief interest of this fasciculus consists in its being the fore-limb equivalent of the pectineus in quadrupeds (or the adductor brevis according to Mr. Wood).

There were no traces of any other muscles in the arm or forearm. The triceps and forearm muscles present in the *Balenoptera* were here represented only by intersecting threads of fibrous tissue totally devoid of muscularity. The shoulder-joint had a distinct capsular ligament lined by a synovial sac; the former was not perforated by any of the neighbouring tendons, and, though thicker below than above, yet had no trace of the inferior scapulo-humeral accessory ligament present in *Balenoptera*. No other joint in the upper limb presented a synovial membrane, all being referable to the amphiarthrodial order of synchondroses. Of the other joints in the body, a synovial capsule existed for the stylo-hyoidean articulation with the squamous bone, but I could not find one for the lower jaw.

I did not notice any undescribed peculiarities in the skeleton worthy of record; the stylo-hyoid cornu was joined to the body by a round arched ligament of some little length, not like the close union which occurs in *Balenoptera rostrata*; the latter is represented (I believe, erroneously) as possessing a long intervenient ligament, in the article "Cetacea" in Todd's 'Cyclopædia of Anatomy and Physiology.'

3. Description of a New Species of Cassowary from Northern Queensland. By GERARD KREFFT, F.L.S., C.M.Z.S., Curator and Secretary of the Australian Museum, Sydney.

The existence of a species of Cassowary in the northern part of Australia has been known for many years, from native ornaments in which Cassowary feathers form a part, and from the report of the survivors of Kennedy's expedition, who state that they actually shot one of these birds. Mr. W. S. Wall, late Curator of this Museum, has even gone so far as to give a very brief description of a Cassowary in a defunct Sydney newspaper, published in June 1854. Gould has quoted this description in his 'Handbook on the Birds of Australia,' accepting the name proposed by Wall, of *Casuarus australis*, though Wall's description (?) was founded on nothing more than the remarks of one of Kennedy's men, that they had shot a bird unlike an Emu with wiry feathers and a topknot or helmet.

The brief account which Wall gives us is as follows:—"The body thickly covered with dark-brown wiry feathers; on the head is a large prominence or helmet of a bright red colour, and to the neck

are attached like bells six or eight round fleshy balls of bright blue and scarlet."

Mr. Carron, who gave some notes to Wall about this bird, has assured me that this specimen had no red helmet, that its plumage was not brown, but black, and that it was not true that twelve hungry men made a meal of a single leg, and had enough and some to spare. So much, therefore, for this very vague account quoted by Mr. Gould.

The Cassowary which I am now about to describe was presented to the Australian Museum by Mr. G. Randall Johnson, who informs me that it was shot by him when on a visit to Messrs. Scott and Co.'s, Herbert Station, in the Gawnie Creek Scrub, near Rockingham Bay. Mr. Johnson has furnished me with a description of the appearance of the fleshy part of the neck in the living bird, and is anxious to see some former statements made by him through Dr. Ferd. Mueller corrected; and as the newspaper account given by Dr. Mueller will probably be quoted by other writers, I call the attention of the Fellows of this Society to the fact that it contains many inaccuracies.

When announcing the discovery of a Cassowary, Dr. Mueller suggested that, if new, it should be named in honour of the discoverer; and acting upon this I beg to propose the name of *Casuarus johnsoni* for it.

General plumage black, the feathers being brown at the base, and black from about the middle to the tip; head surrounded by a compressed helmet, the height of which is about equal to its base; skin of neck smooth, without any folds or hair-covered ridges like those shown on the back of the neck of *Casuarus galeatus*; thin soft hair-like feathers cover the neck; on each side the lower part of the neck is furnished with a few thick glandular fleshy ridges, which in the living bird are deep blue; helmet horny colour (dirty light brown in Mr. Johnson's notes); irides rich light brown; the skin from the bill along the top of the head and extending 5 inches down the back of the neck marine blue; below this, still following the back of the neck down to the point at which the feathers become thick, the coloration is of a cinnabar-red; the underside of the head and throat from the bill downwards ultramarine blue; glandular portion of neck dark blue. Wattles, two in number, bright red, and 4 inches long. The rudimentary wings are provided on the right side with five long smooth shafts; a sixth, nail-like and not more than $\frac{1}{2}$ inch in length, finishes the series. The left wing has four long and straight shafts and a fifth curved one of about 2 inches in length. Toes moderate, rather blunt, except the inner one, which, springing from a broad base, is scarcely curved, and tapers towards a sharp point.

This Cassowary, I am told, confines itself almost entirely to the more open parts of the scrub, and seldom ventures out on the plains. During July, August, and September its food consists chiefly of an egg-shaped blue-skinned berry, the fruit of a large tree; this, together with herbage, probably forms its diet for at least that portion of the year.

4. Preliminary Observations on the Anatomy of *Pontoporia blainvillii*. By Dr. H. BURMEISTER, F.M.Z.S.

Some weeks ago one of my friends brought me the dry body of a specimen of *Pontoporia blainvillii*, which was taken living in the mouth of the River Gueguen Grande, in $38^{\circ} 33'$ S. lat. The body had lost all the external flesh and the greater part of the viscera, and could only be made use of for a skeleton, which is now exhibited in the public museum of Buenos Ayres.

As the internal structure of this interesting animal is entirely unknown, I beg leave to communicate to the Zoological Society my observations made during the examination of the body, some of them being very curious, and worthy, as I believe, to be known to science.

I will not speak of the general figure of the animal and its colour, because most of the external surface was lost; but I may mention that another entirely well preserved individual in our museum has no trace of the white stripe on each side of the body which is represented in D'Orbigny's figure (Voyage, Mamm. pl. 23). The upper part of the whole body is blackish grey, and the whole underside white, which colour extends halfway up the sides, and occupies also the under jaw and the sides of the head. But the general figure of both animals is the same, and therefore I cannot doubt that my species is the same as that figured by D'Orbigny.

As the skull is already well known by the figure in the work above mentioned, I will not enter into a description of that part of the skeleton, especially since Mr. Flower, one of the best-informed observers of the skeletons of the Cetacea, is occupied with a comparative description of the skulls of *Pontoporia* and *Inia*, the former sent by myself to Dr. J. E. Gray for the British Museum.

I will therefore begin my description with the vertebral column, which is composed of forty-two vertebræ, divided into seven vertebræ of the neck, ten of the back, seven of the lumbar portion, and eighteen of the tail, of which the first five are provided with inferior spines or hæmapophyses.

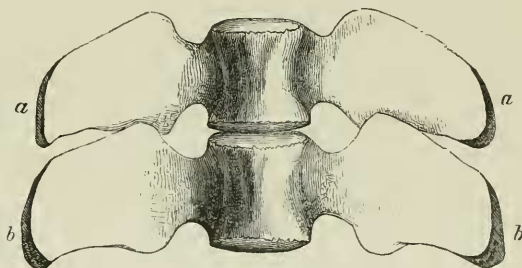
The seven vertebræ of the neck are all free, and none of them anchylosed; they have together an extent of $1'' 10'''$, each of the first two being $5'''$ long, and the five others $2\frac{1}{2}'''$. Only the second vertebra has a strong reclined spinous process, and very broad thick transverse processes; the five following have no spinous processes, but transverse processes of different size and form. The transverse process of the third vertebra is somewhat larger than the same part of the fourth, and the fifth vertebra has the smallest transverse process of all; but on the lower margin of the body of the same vertebra springs up another thick and short tubercle, which is already indicated on the fourth vertebra, and presents itself also on the two following. To this lower tubercle of the seventh cervical vertebra is attached the capitulum of the first rib.

The ten dorsal vertebræ have together an extent of 6 inches, each one being somewhat longer than its predecessor; so that the first is

only 3 lines long, and the last 10 lines. The spinous processes are not very high, but tolerably broad; the anterior one much inclined; the posterior directed more perpendicularly, and double the breadth of the former. The transverse processes decrease in length from the first to the seventh, but increase in breadth; and from there to the tenth they become again longer, as well as broader, the tenth being 16 lines long, and the seventh only 7 lines. Each of these processes has a projection on the anterior margin near the base, and an oblique truncated tip, to which the rib is articulated.

The seven lumbar vertebræ are the largest and strongest of all, the first being 11 lines long and the seventh 12 lines. All have high and large spinous processes, which become somewhat higher posteriorly, so that the three last lumbar vertebræ are the highest of all. The transverse processes of these same vertebræ are extremely broad, and not directed forwards as in the typical Dolphins, but rather backwards: near the base on the fore and hinder margin of each process is a prominent tubercle, which is stronger on the fore margin than on the hinder; and by these projections the processes are united to each other. Even on the fourth, fifth, and sixth lumbar vertebræ the tubercles overlap each other, the hinder of the anterior vertebra lying upon the fore ones of the posterior (see fig. 1), and

Fig. 1.

*Pontoporia blainvillii.*

The second and third lumbar vertebræ, natural size, seen from below.

a a. Second vertebra. *b b.* Third vertebra.

forming in this manner a sort of secondary articulation between the vertebræ, which must make the movement of the lumbar portion of the body very strong, and the vertebral column, if contracted, very firm.

The eighteen caudal vertebræ are of very different form and size, and have together a length of 9 inches 8 lines. The first five have inferior spinous processes, and the same, with the sixth, also superior spines; but each one is somewhat smaller and lower than the foregoing. The transverse processes are much shorter than in the lumbar portion, and do not touch each other with their tuberosities; they soon become smaller, and lose their prominent tip. This decrease is so rapid, that already the fifth caudal vertebra has no

longer a true transverse process, but only a sharp lateral crest perforated at the base by a perpendicular foramen. This perforation is also seen on the sixth, seventh, and eighth vertebræ, but becomes somewhat more directed to the centre of the vertebra. With the ninth caudal vertebra these two perforating channels go to the central part of the vertebral body, which is now only a circular piece of 3-4^{'''} in thickness, somewhat more truncated on the under margin, and somewhat sharper on the upper. After the fourteenth vertebra I can find no more perforations, the four last being very small and short nodules of decreasing size. All these, as far as the twelfth from behind, are enclosed in the axis of the caudal fin.

The animal has ten pairs of ribs attached to the dorsal vertebræ. The first pair is short, only 2^{''} 4^{'''} long; the largest ribs are from the fourth to the eighth, each of these is 6 inches; the last is 3^{''} long. The first four pairs have double attachments, and are divided at the superior end into two prominent processes; the lower, being the capitula costæ, are attached to the body of the last cervical and three first dorsal vertebræ; the upper are the tubercula costæ, of broader but shorter extent, and attached only to the transverse processes of the first four dorsal vertebræ. All the other ribs have only a single superior dilatation attached to the transverse process, and corresponding to the tuberculum of the former. At the lower end the ribs are somewhat broader, and truncated, and united by a small cylindrical sterno-costal bone with the breast-bone or sternum. This bone is composed of two distinct pieces, the anterior of broad subtriangular figure, the hinder smaller and oblong. To the very prominent parts under the fore edges of the first is attached the first pair of ribs, and near the posterior retracted edge the second pair. The second oblong piece of the breast-bone is united by a cartilaginous substance with the first, and bears also on each side two pairs of ribs, being united with them by sterno-costal bones. The first of these bones is broad and flat, and 7 lines long; the others more cylindrical, thinner, and longer, the fourth being 1^{''} 10^{'''} long. The fifth and sixth ribs have also sterno-costal bones, united to the end of the sternum by elastic substance; but the hinder ribs have only a short incurved conical cartilaginous epiphysis.

The bones of the anterior members or breast-fins are of the common cetaceous form. The scapula is triangular, with a curved superior margin, 3 $\frac{1}{2}$ inches long, and has two large anterior processes above the glenoid cavity, the superior or acromion being 1 inch long, and the inferior or coracoid process $\frac{1}{2}$ inch. In the upper arm is a very strong bone, 1 $\frac{1}{2}$ '' long; and in the forearm the two usual bones of nearly equal size, the hinder or ulnar bone being somewhat more prominent at both ends. The whole carpus is cartilaginous, but includes four very small spherical bones, of which the largest, like a pea, is situated in front of the junction of the radius with the ulna, and the smallest, like a small shot, before the thumb. The two others are placed between the connexions of the second, third, and fourth metacarpal bones. These bones are tolerably strong; but the same bone of the thumb or first finger is extremely small, and en-

tirely attached to the cartilaginous carpus. It has only a short cartilaginous tip on the other end. The four following fingers have all a large cartilaginous articulated axis, which includes in the first or second articulation an ossified nucleus. The second finger has six, the third five, the fourth three, and the fifth two articulations, the last of all being only a thin conical prolongation. A similar cartilaginous conical piece is situated between the third and fourth fingers, in the substance of the fin near the exterior margin.

Of the posterior members I have found only the usual small pelvic bones, situated on each side of the anal cleft.

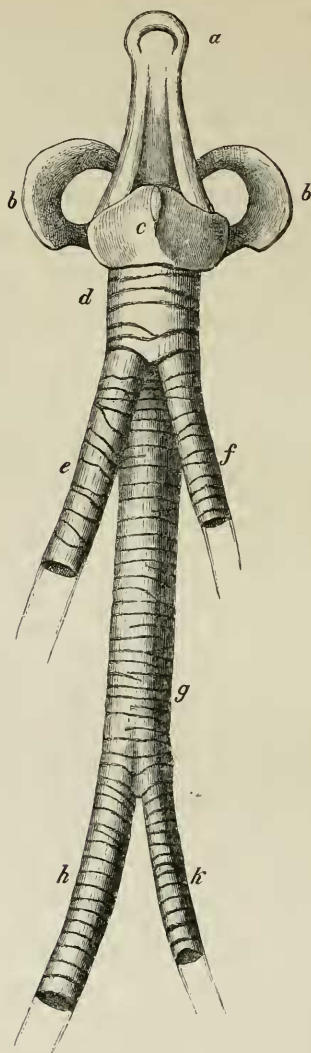
From the fortunate circumstance that some parts of the viscera were preserved in a dry state in the interior of the body, I had the good fortune to be able to examine the larynx with the trachea, and the œsophagus with the stomach. I found in one of these parts a curious peculiarity, which I will explain by the aid of the annexed figure, of two-thirds the natural size.

The larynx (fig. 2, p. 488), which has the usual prolonged conical form above (*a*), is very large below, the thyroid cartilage (*b*) being extended on each side to a distant arch, which is united behind by articulation with the cricoid cartilage (*c*). Beyond this cartilage the trachea begins as a large channel or tube, which is surrounded by three or four spiral cartilaginous rings of the construction usual in all Cetaceans (*d*). Then it divides into three branches of unequal size—two superior smaller, and one inferior wider. Of the two superior the left (*e*) is somewhat wider than the right (*f*), but of the same construction as the commencing trunk and the central branch of the trachea, and perhaps also of the same length; but both branches were cut away in the specimen examined, the left being $1\frac{1}{2}$ inch long and the right only 1 inch. The longer, middle branch (*g*) was preserved to the end, and had a length of 3 inches, then it divided into two branches, of which the left (*h*) is also somewhat wider than the right (*k*). There is no doubt that these branches represent the two bronchi of the other air-respiring vertebrata; but it is curious that the difference in size is much greater than is usually the case. I could follow both bronchi to their end, where they pass into the cellular texture of the lung and lose their cartilaginous rings. The right bronchus was shorter than the left, as well as narrower.

It would be very interesting to know whether the lungs are also divided into four parts, or only into two as is the rule; but having found no trace of this organ in the dry body I can say nothing of its form.

Of the other viscera, I have found in sufficiently good state of preservation the œsophagus and the stomach. The first is 6 inches long, a large channel without any peculiarity; but the second has also its peculiar configuration. It is formed by a great oviform sac, which is extended at both ends into a perpendicular pouch. The pouch of the left side, near the entrance of the œsophagus, is of the size of a pigeon's egg, but not very strongly separated from the central sac. The internal surface is somewhat rugulous, but the wrinkles are very fine and irregularly disposed. The central sac has a length of

Fig. 2.



Larynx and trachea of *Pontoporia blainvillii*, two-thirds of the natural size, seen from above (dorsal side).

- a.* Epiglottis. *b b.* Lateral arches of thyroid cartilage. *c.* Cricoid cartilage. *d.* Trunk of the trachea. *e.* Left branch. *f.* Right branch. *g.* Continuation of the trunk. *h.* Left bronchus. *k.* Right bronchus.

4 inches, is about 2 inches wide, and on the interior surface is provided with about six highly elevated folds, which have other, smaller folds between them. Both begin and end on the entrances of the two pouches at the ends of the stomach. The right pouch, situated near the pylorus, is smaller, but of the same figure and construction as the corresponding one of the other or left side. Over this pouch on the right end a high transverse circular fold separates a small chamber from the central stomach; and this part, after the fold, which is separated into three different lobes by other folds, must be regarded as a separate stomach, or a propylorus, because from it begins the duodenum. There was only a short portion of this intestine; but I could observe soon after the beginning of it an expansion, like a lateral pouch, which is also known in *Phocæna*, and very well figured by Rapp in his interesting work on the 'Cetacea' (Tübingen, 1837-38), pl. 6. f. 3f. I find thus a general resemblance in the stomach of *Pontoporia* to that of *Phocæna*, if we regard only the fundamental type of both, and not the particular execution of this type in the different genera.

In the pouch on the right side of the stomach I found some teeth of a Cephalopodous animal, belonging to the family of *Loligo*, and also the lenses of the eyes of animals of the same group. This proves that *Pontoporia* is a marine animal, and that it goes only from curiosity or necessity in stormy times into the mouths of rivers. The individual which we have had for a long time in the Museum was taken near Maldonado, and is also a young animal; but we have skulls of full-grown size, 16" long, which prove that the whole animal may be 4 feet long, the skull being somewhat more in length than the third part of the whole body. My young specimen is 30 inches long, and the skull measures 11 inches. Under these circumstances I cannot believe that the large Dolphin of 15 feet in length, seen by Freminville on the coast of Brazil, which Dr. Gray mentions in the 'Catalogue of Seals, &c.' p. 232, was of this species.

Note.—As I propose to give an extended description of the skeleton and the other parts, illustrated by well-executed figures, in one of the forthcoming numbers of the 'Años del Museo publico de Buenos Aires,' I have not thought it necessary to enter here into any further details respecting their structure.

5. Notes upon some Interesting Chinese Shells, with a Description of Two or Three New Species of *Unionidæ*, collected at Shanghai by Jones Lamprey, M.D., 67th Regiment, C.M.Z.S. By W. BAIRD, M.D., and H. ADAMS, F.L.S.

(Plate XXVI.)

Amongst a variety of land- and freshwater shells brought from Shanghai by Dr. Lamprey, and lately added to our National Col-

lection, there are several species which deserve some special notice, besides two or three which appear to be undescribed.

1st. *Unio douglasiaë*. In 1833 Dr. Gray shortly described and accurately figured, in the twelfth volume of Griffith's edition of Cuvier's 'Animal Kingdom,' a species of *Unio* which he calls *Unio douglasiaë*. The type specimen of this shell has always been, and still remains, in the collection of shells in the British Museum. Dr. Lamprey has brought a considerable series of this *Unio*, which seems to be not uncommon in the neighbourhood of Shanghai. Perhaps from not knowing the shell as figured in Griffith, Mr. Lea some years afterwards described and figured a species from China, which he named *Unio murchisonianus*, but which, there is no doubt, is the same as the *U. douglasiaë* of Gray. Still later, in the seventh volume of his 'Observations on the genus *Unio*,' he describes and figures a species from Shanghai, which he calls *U. shanghaiensis*. A careful examination of the description and figures of the two last-named species, with the type specimen of that described and figured by Dr. Gray in Griffith's 'Animal Kingdom,' satisfies us that the three species are identical. The name *U. douglasiaë* must therefore stand, having the precedence over the others by some years.

2nd. *Anodonta tenuis*. Another species of the family *Unionidæ*, brought by Dr. Lamprey, appears to be the *U. tenuis* of Gray, figured also in Griffith's 'Animal Kingdom.' In the list of the figures of shells at the end of the twelfth volume of that work this shell appears twice, first under the name of *Anodon tenuis*, and secondly under that of *Unio tenuis*. An examination of the specimens brought by Dr. Lamprey shows that this species belongs more correctly to the genus *Anodonta* than to *Unio*, as no trace of teeth is to be seen in it. A reference to the figure will also demonstrate this; and this shell, therefore, though denominated in the plate *Unio tenuis*, must be now, as indicated in the letterpress, called *Anodonta tenuis*. From there being no lengthened diagnosis given with the figures, these two last-named species are but little known under their original names.

3rd. *Glauconomya primeana*? Two apparently distinct species of *Glauconomya* are in the collection of Dr. Lamprey. One of these appears to resemble somewhat the *G. chinensis* of Gray; and the other more nearly approaches to one lately described and figured in the third volume of the third series of the 'Journal Conchyliologique,' by MM. Crosse and Debeaux, under the name of *G. primeana*. Several specimens of these shells occur; and it is possible they may all be referred to this species, though they differ in some respects from the figure given in the above-mentioned work.

4th. *Anodonta gibba*. A very interesting series also occurs of the *Anodonta gibba* of Cantor and Benson, which shows how considerably this species varies according to age. When adult it is much more rounded, and appears shorter than the younger specimens.

5th. *Nanina ravida*. A very interesting series of a species of *Nanina* was also brought by Dr. Lamprey. Several specimens undoubtedly represent the *Nanina ravida* of Benson, have a tolerably

open umbilicus, and are of a large size; but along with these are a number of specimens which differ in size and have the umbilicus closed. In almost every respect the smaller of these shells resemble the *Nanina redfieldi* of Pfeiffer; but as there is one specimen with a closed umbilicus, nearly of the same size as the true *N. ravida*, and agreeing with it in every other point, it appears to be very difficult, with the exception of the closed umbilicus, to separate the two species from each other. There is also a small species of *Helix* in the collection, which appears to be an elevated variety of the *H. ciliosa* of Pfeiffer.

6th. Among the *Unionidæ* are several specimens of the rather rare *Unio nodosus* of Wood, and one valve, exactly similar to the *Barbala magnifica* of Lea from Japan. *Arconaia lanceolata* (*Triquetra lanceolata*, Lea) and one or two species of *Melania*, more especially *M. cancellata* of Cantor, likewise occur in the collection. A single specimen of *Meretrix* (*Cytherea*, Lam.) *zonaria* (a rare shell), and several others might be enumerated.

7th. Another very interesting shell was brought by Dr. Lamprey, a single specimen of a species of *Unio*, belonging to a form which, till very lately, had only been observed in North America. This may be the *Unio tientsinensis* of Crosse and Debeaux; but as it differs in some respects from the figure given by these authors, we are inclined to consider it distinct.

UNIO (LAMPASILIS) SUBTORTUS, nob. (Pl. XXVI. figs. 1, 1 a.)

U. testa oblique ovata, valde inæquilaterali, solida, ventricosa, concentricè rugoso-striata, ad marginem dorsalem oblique nodoso-plicata; valvis subtortis; umbonibus lateralibus, prominentibus, erosis, ad apices tuberculosus; margine dorsali convexo; margine ventrali ovato; latere antico declivi, convexo; latere postico elongato, oblique ovato, obscure angulato; epidermide olivaceo-fusca, sericea; dentibus cardinalibus crassis, duplicibus, subverticalibus, sulcatis, dente valvæ sinistræ multum majore; dentibus lateralibus elongatis, subarcuatis, transverse sulcatis, in valva sinistra duplicibus; margarita albida.

Long. 55, alt. 50, lat. 28 mill.

Hab. Shanghai, North China (*Dr. Lamprey*).

The nodose plications on the dorsal edge are elevated, but worn. They appear almost to have been originally blunt spines. The shell is longer than the species figured by Crosse, and not so tumid.

UNIO (DYSNOMIA) LAMPREYANUS, nob. (Pl. XXVI. figs. 2, 2 a.)

U. testa subtriangulari, inæquilaterali, solida, compressa, concentricè late et valde plicata; margine dorsali arcuato; margine ventrali arcuato; latere antico circulari; latere postico oblique ovato; umbonibus prominentibus, erosis; epidermide nitida, luteo-olivacea, fusco-viridi radiata; dentibus cardinalibus crassis, verticalibus, duplicibus, sulcatis; dentibus lateralibus

curvatis, elongatis, in valva sinistra duplicibus; margarita argentea, iridescente.

Long. 49, alt. 41, lat. 24 mill.

Hab. Shanghai, North China (*Lamprey and Harland*).

ANODONTA HARLANDI, nob. (Pl. XXVI. figs. 3, 3a.)

A. testa transversa, elongato-ovata, inæquilaterali, tenuiuscula, inflata, concentrice striata; margine dorsali postice arcuato, antice excavato; margine ventrali convexo; latere antico rotundato; latere postico oblique subtruncato, declivitate umbonali obtuse angulato; umbonibus antemedianis, inconspicuis, sulcatis; epidermide fusco-olivacea; margarita cærulea, callositate apicali livido tincta.

Long. 70, alt. 45, lat. 33 mill.

Hab. Shanghai, North China (*Harland and Lamprey*).

Specimens of this interesting species from China were first sent over to the British Museum by the late Dr. Harland, to whose memory we have dedicated this shell.

DESCRIPTION OF PLATE XXVI.

Figs. 1, 1a. *Unio (Lampsilis) subtortus*, p. 491.

2, 2a. — (*Dysnomia lampreyanus*, p. 491.

3, 3a. *Anodonta harlandi*, p. 492.

6. Notes on the Arrangement of Sponges, with the Description of some New Genera. By Dr. J. E. GRAY, F.R.S., V.P.Z.S., F.L.S., &c.

(Plates XXVII., XXVIII.)

Dr. Solander, nearly a century ago, well observed that some sponges are "composed wholly of interwoven reticulated fibres, while others are composed of little masses of straight fibres of different sizes, from the most minute spicula to strong elastic shining spines, like small needles of one-third of an inch long; besides these there is an intermediate sort between the reticulated and the finer fasciculated kinds, which seems to partake of both sorts."—*Zoophytes*, p. 182.

In the 'Annals of Philosophy,' n. s. vol. ix. p. 431, 1825, I published a short notice on the "Chemical Composition of Sponges," in which I pointed out from chemical analysis, I believe for the first time, that the spicules of several sponges consist almost entirely of pure silica.

This paper was very shortly followed by two papers by Dr. Edmund Grant, entitled, 1st, "On Calcareous Sponges," 2nd, "On Siliceous Sponges," published in the 'Edinburgh New Philosophical Journal,' i. pp. 166 & 341, for 1826.

Since the publication of my paper and his, Dr. Grant has pro-

posed to divide sponges into those with calcareous and those with siliceous spicules, and those without any spicules and having only a horny skeleton, and to call them respectively *Spongia calcarea*, *S. silicea*, and *S. keratosa*.

Dr. Bowerbank and several zoologists have adopted this arrangement, changing the names of one or more of the divisions.

The division between the calcareous and the siliceous sponges is very distinct and natural; the separation between the siliceous and keratose sponges, on the other hand, is very indistinct and separates nearly allied genera. Some siliceous sponges are entirely formed of siliceous spicules, covered with a very small quantity of sarcode; in others the spicules are enclosed in a very thin coating of horny or keratose matter; in others the horny matter increases in thickness, and the spicules diminish in quantity until they almost entirely disappear; and sometimes the place of the spicules in the horny fibres is supplied by sand or other siliceous matter, which the fibres take up as they are formed; and the skeleton of some sponges is entirely formed of horny matter; and the passage of these forms into each other is so gradual that I believe it is better to unite the siliceous and keratose sponges of these zoologists into one group or order.

The spicula that form the main part of the skeleton of these siliceous sponges are of three shapes:—

Fusiform (acerate, *Bowerb.*), more or less cylindrical, and pointed at each end.

Needle-shaped (acuate, *Bowerb.*), cylindrical, blunt at one and sharp at the other end.

Pin-shaped (spinulate, *Bowerb.*), cylindrical, with a more or less spherical head and a tapering point.

There are spicula of many other shapes which have been represented by Bowerbank, Quekett, Carpenter, Oscar Schmidt, and other authors; but they are for special purposes, are found in certain parts of the sponge, and are peculiar to certain forms of sponges. Many spicula offer great variation in form in the same species of sponge, and also in the different parts of the same specimen and according to their state of development.

These spicules may be divided into three series, thus:—

(1) The spicula that Dr. Bowerbank calls retentive, and designates as anchorate, (bi- or quadri-) hamate, umbonate, and bi- or trirotulate, all belong to the same series, and each presents several modifications, sometimes in the same species of sponge, and they all gradually pass into each other.

In the same way (2) the *stellate* spicules and (3) the *three-pronged* spicules each belong to a separate series offering many modifications. The stellate are usually scattered in the sarcode; and the *three-pronged* are what Dr. Bowerbank calls *tension* and *defensive* spicules, supporting the outer surface of the sponge, and sometimes for this purpose even extending beyond their surface.

The forms of the spicules are characteristic of the different families, if they are not always absolutely peculiar to them, thus:—

The many-rayed stellate, with rays on all sides, and the three-

pronged or three-hooked elongate spicules are characteristic of the *Geodiadæ* and *Tethyadæ*.

The anchorate and birotulate spicules and other forms of the series are almost peculiar to the family *Esperiadæ*.

The six-rayed stars, often divided at the ends, are peculiar to the *Euplectellidæ* and *Dactylocalycidæ*.

The four-rayed stars, with elongate simple rays, to the *Carteria*.

Dr. Bowerbank has described and figured a large number of the forms of spicules, and the manner in which they are arranged in the different families and genera, in the 'Philosophical Transactions' for 1858, p. 274, and 1862, p. 747. The whole of these plates have been rather coarsely copied in his 'Monograph of the British Spongiadæ,' published by the Ray Society for 1864. And Prof. Oscar Schmidt has also given some excellent figures of the spicules in his work on the 'Adriatic Sponges,' and the two Supplements to that work, 1862 and 1866.

Various systems for arranging sponges have been proposed. The following are the most important:—

M. Ducrotay de Blainville, in his 'Manuel d'Actinologie ou de Zoophytologie,' 8vo, 1834, forms the sponges into a group he calls

LES AMORPHOZOAIRES (*Amorphozoa*), containing the genera:—

1. Alcyoncellum (*Alcyonella in index*). 2. Spongia. 3. Calci-spongia. 4. Halispongia. 5. Spongilla. 6. Geodia. 7. *Cæloptychium*. 8. Siphonia. 9. *Myrmecium*. 10. Scyphia. 11. *Eudea*. 12. *Hallirhoa*. 13. *Hippalimus*. 14. *Cnemidium*. 15. *Lymnorea*. 16. *Chenendopora*. 17. *Tragos*. 18. *Mamon*. 19. *Icrea*. 20. *Tethium*.

The names in *italics* have only been found in the fresh state. He places *Cliona* of Dr. Grant with the Zoophytaires sarcinoides, or Alcyonaires (*Alcyonaria*).

G. D. Nardo has published "Auszug aus einem neuen System der Spongiarien (Spongiariorum Classificatio)" in the 'Isis,' 1833, p. 520, and "De Spongiis," 'Isis,' 1832, p. 714, in which he divides sponges into three orders:—

I. *Spongiaria fulcimentis natura cornea*.

1. Spongia. 2. *Ircinia* (*Sp. cavernosa*, Linn.?). 3. *Aplysia*.

II. *Spongiaria fulcimentis natura silicea, aculeiformibus aut granulosus et substantiæ animalis ope vario modo coalitis*.

1. *Grantia* (*Sp. canabina*, Esper; *Sp. lamia*, *Sp. damicornis*, and *Sp. lactuca*, Esper, not Johnst.). 2. *Raspalia* (*Sp. dichotoma*, Link). 3. *Donatia* (*Sp. lyncurium*, *Sp. cydonium*). 4. *Rayneria*. 5. *Esperia*. 6. *Suberites* (*Alc. domuncula* and *A. ficus*). 7. *Litomena*.

III. *Spongiaria fulcimentis natura calcarea, etc*.

1. *Strangia* = *Alcyonium arboreum*, Linn. 2. *Vioa* = *Alcyonium asbestinum*, Linn.

The two latter are *Zoophytaria*, and not sponges. The arrangement is based:—"E solidarum natura ordines, e contextura genera, e cæteris characteribus species et varietas."

Almost all the species mentioned as belonging to the genera are new and not described in this paper; so that it is impossible to determine what they are except for such persons as have specimens named by the author. When a described species is named it is quoted after the genus in the above extract.

In the 'Isis,' 1834, Nardo changed the names of the genera, *Aplysia* to *Aplysina* and *Ircinia* to *Hircinia*; and in 1844 he added the genus *Spongelia*, which is the same as *Duseideia* of Johnston, 1842.

In 1842 Dr. John Hogg (Ann. & Mag. N. H. viii. 1842, p. 5) proposed the following divisions of the "Order SPONGIÆ":—

Division I. *Spongiæ subcorneæ*. The fibres of a somewhat horny substance without any spicula. *Spongia pulchella*.

Division II. *Spongiæ subcorneo-siliceæ*. Fibres composed of a somewhat horny substance with numerous siliceous spicula. No British species.

Division III. *Spongiæ subcartilagineo-calcareæ*. Fibres of somewhat cartilaginous substance, with the spicula calcareous. *Spongia compressa*, *S. botryoides*, &c.

Division IV. *Spongiæ subcartilagineo-siliceæ*. Fibres composed of a somewhat cartilaginous substance with siliceous spicula. *Spongia tomentosa*, *S. palmata*, and *Spongilla fluviatilis*.

Division V. *Spongiæ subereo-siliceæ*. Fibres of a corky substance with long siliceous spicula. *Spongia verrucosa* and *S. pilosa*.

"At the Scientific Congress held at Lucca (1843) Dr. Nardo proposed a new classification of the *Spongiadæ*, dividing them into five families, under the names of *Corneospongia*, *Silicospongia*, *Calcispongia*, *Corneo-silicospongia*, *Corneo-calcispongia*. These families contain thirty genera."—*Morris, Ann. & Mag. N. H.* iv. p. 242, 1849; from the *Atti della quinta unione degli Scien. Ital. tenuta in Lucca* 1843, p. 436.

Hogg, in 'Ann. & Mag. N. H.' viii. p. 190, 1851, remarks, "By comparing these with my proposed division of the order Spongiæ, published two years before at pages 5 and 6 of the September number, 1841, of the 'Ann. & Mag. Nat. Hist.' (vol. viii.), it will be seen that Dr. Nardo's classification is in most essentials much the same as mine, the only new part appearing to me to be his last and fifth family, which I suppose comprises those species wherein horny fibres combined with calcareous spicula may have been detected."

Dr. Bowerbank, in his paper on *Spongiadæ* in the 'Philosophical Transactions' for 1862, p. 1091, gives the following tabular view of the systematic arrangement:—

Class PORIFERA. Order I. CALCAREA: *Grantia*, *Leucosolenia*, *Leuconia*, *Leucogypsia*.

Order II. SILICEA. Suborder 1. Spiculo-radiate skeletons: *Geo-*

dia, *Pachymatisma*, *Ecionemia*, *Alcyoncellum*, *Polymastia*, *Halyphysema*, *Ciocalypta*, *Tethea*, *Halicnemia*, *Dictyocylindrus*, *Phakellia*, *Microciona*, *Hymenaphia*, *Hymedesmia*. 2. Spiculo-membranous skeletons: *Hymeniacidon*. 3. Spiculo-reticulate skeletons: *Halichondria*, *Hyalonema*, *Isodictya*, *Spongula*. 4. Spiculo-fibrous skeletons: *Desmacidon*, *Raphyrus*. 5. Compound reticulate skeletons: *Diplodemia*. 6. Solid siliceo-fibrous skeletons: *Dactylocalyx*. 7. Canaliculated siliceo-fibrous skeletons: *Farrea*.

Order III. KERATOSA. Suborder 1. Solid non-spiculate kerato-fibrous skeletons: *Spongia*, *Spongionella*. 2. Solid semispiculate kerato-fibrous skeletons: *Halispongia*. 3. Solid entirely spiculate kerato-fibrous skeletons: *Chalina*. 4. Simple fistulo-fibrous skeletons: *Verongia*. 5. Compound fistulo-fibrous skeletons: *Auliskia*. 6. Regular semi-areno-fibrous skeletons: *Stematumenia*, &c. 7. Irregular and entirely areno-fibrous skeletons: *Dysidea*.

This paper contains some most valuable observations on the structure of the skeleton or framework of the different genera, illustrated by excellent figures made under the microscope by Mr. Lens Aldous.

Unfortunately the text is encumbered with a most complicated system of terminology, which renders the descriptions very difficult to understand. The names of the suborders quoted above is a good specimen of this.

Though this work is preceded by a table of the genera of exotic as well as British sponges known to the author, he does not refer to any of the exotic genera which I have described in the 'Proceedings of the Zoological Society' from specimens in the Museum Collection. This is the more remarkable as the Museum Collection of Sponges has been frequently studied by the author; indeed I placed it at Dr. Bowerbank's disposal, with the understanding that he would make a monograph of all the species of the family, or they would have been named some years ago.

The same arrangement is adopted in his work on 'British Sponges,' published by the Ray Society; but one or two new genera are added.

Dr. Oscar Schmidt, in his 'Spongien des adriatischen Meeres,' Leipzig, 1862, folio, with seven plates, divides the sponges into six families:—

1. Calcispongiæ. 2. Ceraospongiæ. 3. Gummineæ. 4. Corticateæ. 5. Halichondriæ. 6. Halisarcinæ.

Dr. Oscar Schmidt divides the *Calcispongiæ* thus:—

I. *Form more or less regular.*

Mouth of tube with simple vertical cilia SYCON.

Mouth of tube with vertical and horizontal cilia DUNSTERVILLIA.

Mouth of tube without cilia UTE.

II. *Form of sponge irregular.*

The wall of the sponge not perforated GRANTIA

The wall of the sponge perforated NARDOA.

Dr. Oscar Schmidt gives the following synoptical table of his genera of *Ceraospongiæ*:—

I. With only one kind of elongated, homogeneous, horny filaments.

Filament very elastic, difficult to split, and very variable in thickness	SPONGIA.
Filament slightly elastic, of unequal thickness	CACOSPONGIA.
Filament scarcely at all elastic, extremely brittle when dry	SPONGELIA.

II. With only one kind of elongated, non-homogeneous filaments.

The bark and axial substance of the filaments different APLYSINA.

III. With two kinds of horny filaments.

The second kind forming a superficial network	DITELLA.
The second kind terminating in a little head.	
Tissue of the finer filaments loose	HERCINIA.
Tissue of the finer filaments dense	SARCOTRAGUS.

The *Halichondriæ* he divides into genera thus:—

I. *The firm horny substance evident, surrounding the spicules.*

The whole sponge-body uniform, horny, and spicular.	
Branches numerous, anastomosing	CLATHRIA.
Branches slender, not anastomosing	RASPALIA.
Part of the sponge horny and part crustaceous.	
Sponge crustaceous; the horny substance forming irregular processes	SCOPALINA.
Sponge branching; the horny substance only in the axis	AXINELLA.

II. *The horny substance none, or little evident.*

The inhaling-pores in sieve-like groups	CRIBRELLA.
The inhaling-pores scattered.	
Oscules on peculiar papilla	PAPILLINA.
Oscules various.	
Skin-clothing very obvious, and alone pigmented . .	ACANTHETHELIA.
Skin-clothing when present without pigment, or with the parenchyma alone pigmented.	
Spicules or needles blunt at the end, and generally knobbed, with special hook-shaped corpuscles . .	ESPERIA.
Spicules or needles blunt at the end, and generally knobbed, without hook-shaped corpuscles	SUBERITES.
Spicules or needles very simple, generally with both ends pointed	RENIERI.
Spicules or needles smooth and nodose, mucous, gelatinous	MYXILLA.
Boring into limestone or shell	VIOA.

The *Corticatæ* into genera thus :—

I. *The cortical layer with stellules.*

Needles uniform, simple TETHYA.
Needles simple and anchor-shaped STELLETTA.

II. *The cortical layer with globules.*

Cortical layer with globules only CAMINUS.
Cortical layer with globules and needles GEODIA.

III. *The cortical layer without globules or needles.* . ANCHORINA.

Dr. Schmidt published a Supplement in 1864, and a second in 1866; in the latter he examined Dr. Bowerbank's genera in his work on 'British Sponges,' and states the genera to which he would refer them.

Dr. Schmidt's criticism on Dr. Bowerbank's genera is peculiar. Dr. Schmidt forms genera on a very different system to Dr. Bowerbank, and then refers certain species to the genera which he has himself used, and observes that the other species of Dr. Bowerbank belong to different genera.

Dr. Bowerbank might with equal fairness have criticised Dr. O. Schmidt's genera on the same system and with equal truth, except that he would not have been able to place the name of Nardo after the generic name; but this is also equally unfair, for, though the genera may bear Nardo's name after them, they are characterized and restricted by Dr. O. Schmidt.

MM. P. Duchassaing and G. Michelotti, in their 'Spongiaires de la mer Caraïbe,' Harlem, 1864, 4to, with twenty-five coloured plates, published in the 'Natuurk. Verh. Holland. Maat. Wet. te Harlem,' vol. xxi. 1864, proposed the following arrangement :—

Order I. DICTYOSPONGIÆ. Keratose network furnished with spicules; fibres forming a network.

Fam. 1. EUSPONGIÆ. Keratose network well developed; siliceous spicules wanting or very rudimentary.

Subfam. 1. *Penicillatæ*. Horny fibres forming nerves, pencils, or columns, but are never distinctly separate as in the other subfamilies.

Subfam. 2. *Heterogenæ*. Fibres distinct, and of two kinds.

Subfam. 3. *Homogenæ*. Fibres horny, hollow, very rigid, equal, and anastomosing into meshes, but never uniting into bundles.

Fam. 2. LITHOSPONGIÆ. Keratose network formed by siliceous fibres; texture decidedly stony.

Fam. 3. HALYSPONGIÆ. The spicules are siliceous and well developed, predominating over the others.

Subfam. 1. *Armataæ*. Spicules needle-shaped, forming a mesh with others, which are anchor-shaped.

Subfam. 2. *Subarmatae*. Only one system of acuiform spicules.

Subfam. 3. *Tricuspidatae*. With tricuspid spicules.

Order II. OXYSPONGIÆ. Keratose framework does not exist, or is almost completely atrophied.

Subfam. 1. *Imperforantes*. Numerous spicules support the soft portions of the sponge.

Subfam. 2. *Perforantes*. The spicules when developed only play a secondary part in giving a support to the soft parts.

These three works describe many species of sponges, and present genera formed on very different principles and characters. The work of MM. Duchassaing and Michelotti pays much less attention to the microscopic structure of the sponge and the form of the spicules than either of the others. The characters of Professor Oscar Schmidt are best; but the number of species which he describes is small, and his system is artificially founded on a few prominent characters that could be easily tabulated. The work of Dr. Bowerbank contains a much more extended series of observations, and would be far superior to either of the others, if it were not deformed by his prolix style and the extraordinary nomenclature that he uses. Though he repeatedly says that external form is of no importance in a generic point of view, yet some of his genera, indeed the most natural ones, arise from his having been influenced by studying the forms and other peculiarities of the sponge.

After many years attention to the study of sponges and their spicula, and the study of the various works published on them, especially those of Drs. Bowerbank and Oscar Schmidt, I would propose the following arrangement as bringing together the species which seem most allied, and also as facilitating the study of these very difficult and anomalous animals. The system was originally sketched out in 1840, and put aside. The works of Dr. Bowerbank and Dr. O. Schmidt and my subsequent observations have enabled me to improve it, and have confirmed me in the belief that it is an improvement on those before proposed.

The spicules are organized bodies, and are doubtless the most important part of the sponge; they are sufficiently varied in form to present excellent characters for the distinction of sponges into orders, genera, and species.

To properly distinguish the species of sponges it is necessary that all the kinds of spicules occurring in each species should be observed and noted. This being the case, the study of the sponges must be facilitated by their being divided into groups according to the form and structure of the spicules, subdivided according to the manner in which the various forms are combined in each species.

It is much more easy to find the species characterized by these spicules when the sponges are so arranged than to have to read the descriptions of the species arranged into a few genera, as in Dr. Bowerbank's and Prof. O. Schmidt's works, to discover which of the

species in these genera have the spicules of that form, or with the forms so combined together. The modification of the forms and the comparative sizes of the different forms as combined together afford good characters for the distinction of the species of the genera or subgenera.

There are more genera than I would willingly have made without more materials; but I could not exhibit the system which I wished to propose without forming some genera on very imperfect materials, as on a bihamate spicule figured in Bowerbank's 'British Sponges.'

I have no doubt that some, indeed many, zoologists will complain of the numerous genera into which the sponges are here divided; but I believe that sponges will never be properly distinguished into species until they are even more closely divided into genera or subgenera than is here proposed. At least this has been shown to be the case with *Diatomaceæ*, *Algæ*, and the animals which require the microscope to distribute them into groups or species.

No part of the sponge seems so well adapted for the purpose of so dividing them as the spicules that form their skeleton, which afford, both in their form and in the combination of one or more forms of the same kind, the best characters for the separation of the sponges into genera and the distinction of the species.

I may state that many of the names used for the genera have no derivations, but are mere fortuitous combinations of letters, so that compilers of indices of genera need not attempt to find derivations for them, or to correct the formation of some of them, as being more consistent with the derivations they may gratuitously assign to them, as has been done with some generic names of the same kind by Agassiz and others.

It is only necessary to look at Dr. Bowerbank's work on 'British Sponges,' to show that some other system than that which he has adopted is necessary; for out of 193 species of British sponges no less than 43 are referred to the genus *Isodictya*, 42 to *Hymeniacion*, 28 to *Halichondria*, and 11 to *Dictyocyclus*; so that 124 are referred to four genera, and the remaining 69 species are divided into 26 genera.

Class PORIPHORA.

Spongia, Linn.

Amorphozoa, Blainville, Manuel Act. 1821.

Poripkera, Grant, Outlines of Anat. 1841.

Porifera, Bowerbank, Phil. Trans. 1850, p. 186; Brit. Sponges, 1862; Carpenter, Microscope, p. 536 (not Hogg, Ann. & Mag. N. H. 1840, iv.).

Porophora, Hogg, Ann. & Mag. N. H. 1840, iv.

Gelatinifera, Hogg, Ann. & Mag. N. H. 1840, iv.

Spongiotista, Hogg, Athenæum, 1867, p. 160.

Spongiadæ, Bowerbank, Brit. Sponges, 1864.

The sponges consist of a flesh or *sarcode* formed of aggregations of *amœba*-like bodies, some of which are furnished with one or more

long cilia, supported by a skeleton consisting of calcareous or siliceous spicules or horny network. The spicules have a distinct animal basis; hence it seems probable that each spicule was originally a segment of sarcode which has undergone calcification or silicification, and by the self-shaping power of which the form of the spicule is mainly determined.

The mass of sarcode and spicules called the Sponge is permeated by a series of canals having a distribution proper to each kind of sponge. The ciliated cells seem to form the walls of the canals, which may be said to commence in the small *pores* of the surface and to terminate in the large vents or *oscles*; and a current of water is continually entering at the former and passing forth from the latter during the life of the sponge, bringing in alimentary particles and oxygen, and carrying out excrementitious matter (see Dr. Carpenter's 'Microscope,' p. 530).

The sponges are reproduced or multiplied by gemmation, which is effected by the detachment of minute globular particles of sarcode (covered with a more or less distinct thin membranaceous skin) from the interior of the canals, when they sprout forth as little protuberances, whose foot-stalks gradually become narrower and narrower until they give way altogether. These *gemmules*, like the *zoospores* of Algæ, possess cilia, and, issuing forth from the vent, transport themselves to distant localities, where they lay the foundation of new fabrics.

According to the observations of Mr. Huxley on the marine genus *Tethya* (Ann. & Mag. N. H. vii. 1851, p. 370), a true sexual generation also takes place, both ova and sperm-cells being found imbedded in the substance of the sponge. The bodies distinguished as capsules (ovisacs), which are larger than the gemmules, and which usually have their investments strengthened with siliceous spicules very regularly disposed, are probably the product of this operation. They contain numerous globular particles of sarcode, every one of which when set free by the rupture of the envelope (?) becomes an independent *amœba*-like body, and may develop itself into a complete sponge. The phenomena of sexual reproduction and development have since been more particularly studied in the *Spongillæ* or Freshwater Sponges, especially by Mr. Carter (Ann. & Mag. Nat. Hist. xiv. 1854, p. 334, & xx. 1857, p. 21), and by Lieberkühn in Müller's 'Arch.' 1856, in 'Reichert und du Bois-Reymond's Arch.' 1859, abstracted in 'Ann. & Mag. Nat. Hist.' xviii. 1856, p. 403, and the 'Quarterly Journ. of Microscopic Science,' v. 1857, p. 212.

From the observations of Mr. Carter (Ann. & Mag. Nat. Hist. iv. 1849, p. 81) the sponge appears to begin life a solitary *amœba*; and it is only in the midst of an aggregation formed by the multiplication of these that the characteristic *sponge*-structure makes its appearance, the formation of the spicules being the first indication of such organization.

In this essay I have made free use of the very accurate and admirable figures of the spicules in the plates that accompany Professor O. Schmidt's and, especially, Dr. Bowerbank's works and papers,

having perfect faith in Mr. W. Lens Aldous's accuracy. I can speak of the accuracy of the plates of both these authors from the result of my own observations; and having full reliance on them, they seem to be as available for my purpose as if I had myself repeated all their researches.

The arrangement here proposed is to be regarded as an attempt to divide the sponges into groups and genera, so as to enable the student to discover the name and alliance of the species under his examination, which I have been repeatedly told the [preceding systems have failed to effect. It is only a prodromus, and a very imperfect one, requiring revision, correction, and extension. For example, the large reticulated horny sponges, which form the greater part of collections in museums, and the external forms of which have been figured in Esper's, Duchassaing and Michellotti's, and several other zoological works, require to be microscopically examined and systematically described.

The British Museum have received from Dr. Oscar Schmidt typical specimens and preparations of the spicules of almost all the species he has described from the Adriatic Seas.

The class is divisible into two subclasses, according to the chemical constituent of the skeletons; in one the spicules are *calcareous*, and in the other when present siliceous, or more or less mixed with a horn-like animal material.

Subclass 1. PORIPHORA SILICEA.

The sponges provided with a siliceous or horny skeleton, or with a horny skeleton strengthened with siliceous spicules.

Porifera keratosa et *P. chalinida*, "Grant, Tabular View, 1861;" Bowerbank, B. Sponges, i. p. 154.

Porifera silicea et *P. keratosa*, Bowerbank, B. Sponges, i. pp. 155, 166.

SYNOPSIS OF FAMILIES.

Section I. MALACOSPORE (Soft-spored Sponges). *Reproduction by ova contained in a thin membranaceous ovicel not strengthened by siliceous spicules or by gemmules, scattered in the substance of the sponge.*

Subsection 1. Netted Sponges (DICTYOSPONGIÆ). *Skeleton formed of a continuous siliceous or horny network.*

Order I. CORALLIOSPONGIA. Sponges hard, coral-like, entirely formed of siliceous spicules anchylosed together by siliceous matter into a network. Mass covered with a thin coat of sarcode when alive.

Fam. 1. DACTYLOCALYCIDÆ. Sponge massive, expanded or flabellate, reticulate, angular.

Fam. 2. *APHROCALLISTIDÆ*. Sponge tubular; tubes reticulate, sub-circular, closed at the end with a netted lid.

Order II. *KERATOSPONGIA*. Sponge elastic. Skeleton formed of horny netted fibres, generally without, but sometimes more or less strengthened with, minute siliceous spicules or grains of sand.

Fam. 3. *SPONGIADÆ*. Skeleton formed of one kind of reticulated horny fibres, not enclosing any spicules or sand.

Fam. 4. *HIRCINIADÆ*. Skeleton formed of two kinds of horny fibres:—the one, forming the base of the skeleton, thick, reticulated, with a more or less distinct central line of minute spicules or grains of sand; the other very slender, at the apex of the branches, which do not anastomose.

Fam. 5. *DYSIDEIDÆ*. Skeleton formed of reticulated horny fibres with sand or spicules of other sponges imbedded in the centre, and covered with a more or less thick coat of horny matter. Brittle when dry.

Fam. 6. *CHALINIDÆ*. Skeleton formed of reticulated horny anastomosing filaments, which have one or more series of siliceous spicules in the central line.

Fam. 7. *OPHISTOSPONGIADÆ*. Skeleton netted horny, or expanded skin-like fibres, covered with superficial spicules, forming an irregular coat, or which are single or grouped, and divergent from the surface.

Fam. 8. *PHAKELLIADÆ*. Skeleton formed of closely reticulated horny fibres, forming an expanded mass; spicules numerous, in bundles, forming radiating, repeatedly branched lines, which do not anastomose on the surface.

Subsection 2. *Spicular Sponges (SPICULOSPONGIÆ)*. *Sponge fleshy, more or less strengthened by fasciculated or scattered siliceous spicules, the bundle being sometimes slightly covered with a thin layer of horny matter. The sarcode is generally abundant; in some few, as Euplectella, it is thin, mucilaginous, and deciduous.*

Order III. *LEIOSPONGIA*. Sponge-spicules only of one kind, often varying in size and shape in the same species.

Fam. 9. *HALICHONDRIADÆ*. Skeleton composed of fusiform or pin-shaped spicules variously fasciculated together, or rarely united by a small quantity of horny matter. Sarcode granular or fleshy.

Fam. 10. *POLYMASTIADÆ*. Sponge with tubular fistulous branches; tubes open at the end, and formed of longitudinal and transverse fascicules of fibres.

Fam. 11. CLIONIADÆ. Sponge living and making holes in shells, corals, and limestone. Skeleton composed of pin-shaped fusiform and cylindrical spicules fasciculated together. Sarcode granular.

Order IV. ACANTHOSPONGIA. Spicules of more than one form or kind in the same sponge.

Fam. 12. EUPLECTELLADÆ. Sponge tubular. Skeleton composed of longitudinal, transverse, and oblique bundles of spicules intersecting each other and forming a network. Sarcode mucilaginous, studded with many-rayed stellate spicules.

Fam. 13. ESPERIADÆ. Sponge massive. Skeleton composed of fusiform and linear spicules, interspersed with anchorate, biharmate, or birotulate spicules. Sarcode soft.

Fam. 14. TETHYADÆ. Sponge subglobular or massive. Skeleton consisting of simple filiform spicules, with three prongs or three recurved points at the outer end, and with more or less globular many-rayed stellate spicules.

Subsection 3. Sand Sponges (ARENOSPONGIÆ). *Sponge consisting of a subcircular disk of agglutinated sand or siliceous spicula, with a series of diverging filiform spicules on the circumference, and pencils of similar spicules on the mouth of the oscules on the upper surface of the disk.*

Order V. ARENOSPONGIA.

Fam. 15. XENOSPONGIADÆ.

Section II. CHLAMYDOSPORÆ (Sponges with armed spores). *Reproduction by a thick ovisac, strengthened with siliceous spicules, the ovisac often at length becoming solid spheres formed of siliceous spicules radiating from a central point.*

Order VI. SPHÆROSPONGIA. Ovisac composed of closely packed fusiform spicules diverging from a centre, which, when the ova are emitted, extend internally and fill up the cavity, forming a nearly solid ball.

Fam. 16. GEODIADÆ. Globose or subglobose, fleshy; the ovisac forming a hard external coat.

Fam. 17. PLACOSPONGIADÆ. Branched; the ovisac forming a central axis and external plates, separated by sarcode and fasciculated spicules.

Order VII. POTAMOSPONGIA. Ovisac coriaceous, strengthened with various-shaped spicules placed on, or in the substance of, the ovisac.

Fam. 18. SPONGILLADÆ.

SYNOPSIS OF GENERA AND SPECIES.

Section I. MALACOSPORÆ, or Sponges with soft spores or gemmules.

Reproduction by ova contained in a thin membranaceous ovisac not strengthened by spicules or by gemmules, scattered in the substance of the sponge.

These sponges are easily known by the absence of the hard siliceous or siliceous-armed ovisacs that are to be found abundantly in the substance of those of the following section.

Subsection 1. Netted Sponges (DICTYOSPONGIÆ). *Skeleton formed of a continuous siliceous or horny network.*

The fleshy part of the sponge is generally gelatinous and dried up, leaving little to be observed in the dry sponges, and often easily washed away.

Order I. CORALLIOSPONGIA.

Sponge hard, coral-like. Skeleton entirely formed of siliceous spicules, anchylosed together by siliceous matter, forming a netted mass covered with sarcode.

The skeleton is formed of large siliceous spicules anchylosed together by siliceous matter. The sponges in which the siliceous element is the most developed are siliceous sponges *par excellence*.

Fam. 1. DACTYLOCALYCIDÆ.

Sponge massive, expanded or flabellate; the network with angular meshes.

Lithospongiæ, Duchass. & Michel. Spong. Caraïb. p. 25.

This beautiful family of sponges is at once known by having the skeleton formed of continuous anastomosing fibres formed of concentric lamina of silica, forming a hard brittle network. When alive they are covered with a continuous external skin, which is pierced with oscules on the upper and sometimes on the lower surface.

As most of the species have been described at length in the 'Proceedings of the Society,' I only give a synopsis of the genera for the purpose of bringing them together in one view.

* *Network irregular, not symmetrical.*

1. DACTYLOCALYX.

Dactylocalyx, Stutchbury, P. Z. S. 1841, p. 86; Bowerbank, B. Sponges, i. p. 203; ii. p. 11 (*Dactylochalix*, Bowerbank, in B. M.) *Iphyteon*, Valenc. Institut.

Sponge expanded, with large sunken grooves and oscules on the upper and lower surface. Spicules of skeleton tuberculated; spicular network rugose, tubercular. Sarcode with scattered radiated or stellate spicules, divided into branches near the base, and with knobs at the tip of the rays.

Sarcode studded with many-rayed stellate spicules; the six prin-

apical rays diverging on all sides, and divided near the base into several elongated cylindrical linear rays, which diverge from each other, and are tipped with a small apical knob like the head of a pin (see Bowerb. Brit. Spon. t. 8. f. 190-192).

1. DACTYLOCALYX PUNICEA. (Pl. XXVII. fig. 2.) B.M.

Dactylocalyx puniceus, Stutchbury, P. Z. S. 1841, p. 86; Bowerb. B. Sp. i. p. 204; ii. p. 11. f. 190, 191, 198, 275 (skeletons).

Iphiteon panicea, Valenc. Mus. Paris; Bowerb. B. Sp. f. 190, 191, 192, 275, 340, 341 (skeletons and gemmules).

Sponge broad, expanded; upper surface rather concave.

Hab. West Indies: Barbadoes (*Stutchbury*); St. Vincent's, West Indies (*Mr. Ingall*).

2. DACTYLOCALYX SUBGLOBOSA. (Pl. XXVII. fig. 1.) B.M.

Sponge subglobose, with a deep central concavity above; the outer surface with irregular anastomosing oscules.

Hab. Malacca?

3. DACTYLOCALYX PRATTHI, Bowerb. B. Sp. i. p. 204. f. 52, 276, 278, 306 (spicular network).

Skeleton smooth in part, with crowded groups of tubercles, and with stellate spicules in the dermal surface (see Bowerb. B. Sp. i. p. 52).

Hab. —?

2. MYLIUSIA, Gray, P. Z. S. 1859, p. 439, t. 16.

The sponge conical, cup-shaped, pierced with numerous short truncated tubes, forming raised folded anastomosing lamina on the lower surface.

MYLIUSIA CALLOCYATHES, Gray, P. Z. S. 1859, p. 439, *Radiata*, pl. xvi. B.M.

Hab. West Indies.

Var.? In the British Museum there is a second specimen of a smaller size, very irregular in form, which is perhaps a second species.

Hab. West Indies. B.M.

Lithospongia torva, Duchass. & Michel. Spong. Caraïb. p. 64, t. 12. f. 3, 4, from the West Indies, appears to be a species of this family, with a skeleton of netted siliceous fibres with wide angular meshes and without any spines.

There are two smaller specimens in the British Museum which probably belong to the same species. The smaller one was collected by the Rev. L. Guilding at St. Vincent in 1840; and the other was received from the West Indies by Mr. Scrivener in 1842.

3. MACANDREWIA, Gray, P. Z. S. 1859, p. 438, t. 15.

The coral expanded, cyathiform; the upper and lower surface smooth, the upper surface with small oscules; fibres of skeleton small,

with stellate spicules on the dermal surface. The stellate spicules three-rayed; the rays forked and reforked.—*Bowerbank, B. Sp.* f. 53.

MACANDREWIA AZORICA, Gray, P. Z. S. 1859, p. 438, *Rad.* pl. xv. B.M.

MacAndrewsia azorica, Bowerb. B. Sp. p. 204, t. 15. f. 274 (skeleton).

Dactylocalyx bowerbankii, Johnson, P. Z. S. p. 186; Bowerb. B. Sp. f. 53. B.M.

Dactylocalix bowerbankii, Bowerb. B. Sp. p. 236. f. 53.

Hab. Azores: St. Michael (*MacAndrew*); Madeira (*Johnson*).

The specimen which Mr. J. Yate Johnson has described under the name of *D. bowerbankii* is larger, more orbicular, and expanded than the one I described years before as *MacAndrewia azorica*; but I cannot see any other difference.

** *Network symmetrical.*

4. *FARREA*, Bowerb. B. Sp. i. p. 204, ii. p. 12.

Skeleton reticulate, symmetrical; filaments regular, with a continuous central canal and conical granulated tubercles on each side of the intersections. Sarcodæ with many fusiform and slender bihamate scattered spicules.

FARREA ORCA, Bowerb. B. Sp. i. p. 204, ii. p. 12. f. 114, 199, 200, 277, 311 (skeletons and sponges); Owen, Trans. Linn. Soc. xxii. t. 21. f. 8, 9.

Hab. Seychelle Islands (*Mus. Dr. Farre*).

Fam. 2. APHROCALLISTIDÆ.

Sponge tubular; tubes closed with a reticulated lid; parietes formed of agglutinated siliceous spicula, with round horizontal lateral pores; inner surface strengthened with clustered longitudinal bundles of elongated spicula.

This family is intermediate between *Dactylocalycidæ* and *Euplectelladæ*; it has the distinct agglutinated netted spicula of the former lined within by the bundle of elongated spicula of the latter.

APHROCALLISTES, Gray, P. Z. S. 1858, p. 114.

Sponge tubular, closed with a lid, with smaller lateral tubular branches, which are generally open at the end.

In the description of this sponge in the 'Proceedings of the Society' above referred to, it is said by a slip of the pen to be calcareous, when it ought to have been siliceous. In all other respects I have nothing to add to the description.

APHROCALLISTES BEATRIX, Gray, P. Z. S. 1858, p. 114, *Rad.* pl. xi.

Hab. Malacca (*Belcher*).

B.M.

Order II. KERATOSPONGIA (Horny Sponges).

Sponge elastic. Skeleton formed of horny netted fibres, generally without, but sometimes more or less strengthened with, minute siliceous spicules or grains of sand.

These are the horny sponges *par excellence*, the skeleton consisting of horny fibres, more or less strengthened by siliceous spicula, which are generally of a small size.

Dictyospongia, Duchassaing & Michelotti.

Spongia keratosa, Bowerb. B. Sp.

Fam. 3. SPONGIADÆ.

Skeleton formed of one kind of reticulated horny fibres, not enclosing any spicules or sand.

Euspongia, Duchassaing & Michelotti, *l. c.* p. 25.

* *Fibres of skeleton solid, homogeneous.*

1. SPONGIA, Linn.

Sponge irregularly netted. Fibres of skeleton solid, cylindrical, without spicules, very elastic, and nearly of equal thickness.

Spongia, Nardo, Isis, 1833, p. 321; Bowerb. B. Sp. i. p. 205; O. Schmidt, Spong. Adriat. Suppl. ii. p. 9.

Euspongia, Bronn.

SPONGIA OFFICINALIS.

B.M.

Spongia officinalis, Nardo, Isis, 1833; Bowerb. B. Sp. i. p. 205, t. 37. f. 379, t. 13. f. 261.

See also—

S. quarnerensis, O. Schmidt, *l. c.* p. 22, t. 2. f. 2, t. 3. f. 1.

S. zimocca, O. Schmidt, *l. c.* p. 23, t. 2. f. 3, 4.

S. equina, O. Schmidt, *l. c.* p. 23, t. 2. f. 5.

S. mollissima, O. Schmidt, *l. c.* p. 23.

2. SPONGIONELLA.

Sponge symmetrical, very elastic, netted; the primary fibres thicker, radiating; secondary thinner, horizontal.

Spongionella, Bowerbank, B. Sp. i. p. 206; O. Schmidt, Spong. Adriat. Suppl. ii. p. 9.

SPONGIONELLA PULCHELLA, Bowerbank, B. Sp. i. p. 206, t. 37. f. 380; ii. p. 359.

B.M.

Spongia pulchella, Sow. Brit. Misc. p. 87, t. 43; Johnson, B. S. p. 167, t. 19. f. 1, 2.

Cacospongia scalaris, O. Schmidt, Spong. Adriat. p. 27, t. 2. f. 4.

Hab. British Seas.

3. CACOSPONGIA, O. Schmidt, Spong. Adriat. 27.

Skeleton composed of hard, rather elastic, homogeneous fibres of unequal thickness.

1. CACOSPONGIA MOLLIOR, O. Schmidt, p. 27. B.M.

Hab. Adriatic.

2. CACOSPONGIA CAVERNOSA, O. Schmidt, p. 28. B.M.

Hab. Adriatic.

4. SIPHONIA, Blainv. Man. Act. p. 536.

Sponge polymorphic, with a central apical aperture or cloaca, with large longitudinal and smaller transverse canals; composed of dense fibres.

SIPHONIA TYPUM, Blainv. Man. Act. p. 536, t. 95. f. 1.

Hab. Sicily.

B.M.

*** Fibres of one kind, the more solid axis being surrounded by a softer cortical substance?*

5. APLYSINA, O. Schmidt, Spong. Adriat. p. 25.

Sponge fleshy; fibres of one kind, slightly elastic, consisting of a solid axis, surrounded by a softer bark.

Aplisia, Nardo, not Linn.

1. APLYSINA AEROPHOBA, Nardo; O. Schmidt, p. 25, t. 3. f. 2.

Hab. Adriatic.

B.M.

2. APLYSINA CARNOSA, O. Schmidt, p. 26, t. 3. f. 3.

Hab. Adriatic.

**** Fibres with a central tube.*

6. VERONGIA.

Sponge irregularly netted; the fibres with a central canal, without spinules.

Verongia, Bowerbank, Ann. & Mag. N. II. xvi. p. 400, 1845; Brit. Sp. i. p. 209; O. Schmidt, Spong. Adriat. Supp. ii. p. 10.

Aplysia, Nardo, 1854.

Aplysina, Nardo, 1844, 1862; O. Schmidt, Spong. Adriat.

1. VERONGIA FISTULARIS, Bowerb. B. Sp. i. p. 209, t. 13. f. 266.

Spongia fistularis, Lamk.

2. VERONGIA ZETLANDICA, Bowerb. B. Sp. ii. p. 280.

Hab. Zetland.

*** *Fibres with numerous blind tubes.*

7. AULISKIA.

Sponge massive, irregularly netted; fibres with a central canal, which is furnished with small blind branches radiating in all directions.

Auliskia, Bowerb. Ann. & Mag. N. H. xvi. p. 405, 1845; Brit. Sp. i. p. 210.

Auliscia, O. Schmidt, Spong. Adriat. Suppl. ii. p. 10.

AULISKIA BOWERBANKII, Bowerbank, Ann. & Mag. N. H. xvi. p. 405, t. 13. f. 1, 2; B. Sp. t. 14. f. 267, 268.

Hab. —?

Fam. 4. HIRCINIADÆ.

Skeleton formed of two kinds of horny fibres:—the one thick, and with a central line of spicules or grains of sand within, reticulated, forming the base of the skeleton; the other very slender, forming radiating spicular tufts, which do not anastomose.

Filifera, Lieberkühn; O. Schmidt.

Ircinia et *Hircinia*, Nardo.

1. HIRCINIA, O. Schmidt, p. 32.

Sponge of a lax texture; skin less dense.

1. HIRCINIA FLAVESCENS, O. Schmidt, p. 33, t. 3. f. 9, 12–14.

Hab. Adriatic.

2. HIRCINIA DENDROIDES, O. Schmidt, p. 32, t. 3. f. 10. B.M.

See also:—

Hircinia typica, O. Schmidt, p. 32. B.M.

H. panicea, O. Schmidt, p. 32, t. 3. f. 11.

H. hirsuta, O. Schmidt, p. 33, t. 3. f. 13.

H. hebes, O. Schmidt, p. 33, t. 3. f. 9, 26.

H. variabilis, O. Schmidt, p. 34, t. 3. f. 17. B.M.

H. fasciculata, O. Schmidt, p. 34. *Spongia fasciculata*, Esper, ii. t. 34.

2. SARCOTRAGUS, O. Schmidt, p. 35.

Sponge very dense, nearly fleshy; the minute fibres very abundant.

1. SARCOTRAGUS SPINULOSUS, O. Schmidt, p. 35, t. 3. f. 18.

Hab. Adriatic. B.M.

2. SARCOTRAGUS FÆTIDUS, O. Schmidt, p. 35, t. 36. f. 3, 19.

Hab. Adriatic. B.M.

3. STEMATUMENIA, Bowerb. B. Sp. i. p. 211, 1862.

Sponge massive, horny; fibres of different diameters, reticulated,

with central lines of spicula and grains of sand, and other extraneous matter, especially in the larger and thicker fibres.

Stematumenia, Bowerb. Ann. & Mag. N. II. 1845, xvi. p. 406, t. 14. f. 1, 2.

Hircinia, sp., O. Schmidt.

Sarcotragus, O. Schmidt.

STEMATUMENIA BAHAMENSIS.

Bahama sponge, Bowerb. B. Sp. i. p. 273, f. 269, f. 381.

Hab. Bahama.

Fam. 5. DYSIDEIDE.

Sponge massive, formed of reticulated horny fibres, with sand (or the spicula of other sponges) imbedded in the centre, and covered with a more or less thick coat of horny matter.

DYSIDEA.

Sponge massive. Skeleton irregular, netted.

Dysidea, Johnston, Brit. Sp. p. 251; Bowerb. B. Sp. 1862; O. Schmidt, Spon. Adriat. Supp. ii. p. 11.

Duseideia, Johnston, B. Sp. p. 185, 1842.

Spongelia, Nardo, 1844; O. Schmidt, 1862.

Dr. G. Johnston described a sponge under the name of *Spongia suberea* in 'Mag. Nat. Hist.' vii. p. 491, f. 60, which, in his work on Sponges, he referred to the genus *Duseideia* with a mark of doubt, observing at the same time "it is nearly allied to the *Alcyonium ocellatum* of Solander (Zooph. p. 180, t. 1. f. 6), and it is probable that the two productions are of the same nature, whatever they may be." They have proved both to be *zoanthoid polypes*.

1. *DYSIDEA FRAGILIS*, Johnston, B. Sp. p. 251; Bowerb. B. Sp. ii. p. 381, i. p. 211. f. 270-272. B.M.

Duseideia fragilis, Johnston, B. Sp. p. 186, t. 13. f. 6, t. 14. f. 4.

Halichondria areolata, Johnston, B. Sp. p. 121, t. 13. f. 4.

Spongia fragilis, Mont. Wern. Mem. ii. p. 114, t. 16. f. 1, 2.

See also :—

Spongelia elegans, Nardo; O. Schmidt, p. 28, t. 3. f. 3. B.M.

S. avara, O. Schmidt, p. 29, t. 3. f. 6. B.M.

S. incrustans, O. Schmidt, p. 29, t. 3. f. 7.

S. pallescens, O. Schmidt, p. 30, t. 3. f. 8. B.M.

2. *DYSIDEA KIRKII*, Bowerb. B. Sp. i. p. 211.

Hab. Australia (not described).

Fam. 6. CHALINIDE.

Skeleton formed of regular, reticulated, anastomosing, horny fibres, which have one or more series of regular small siliceous spicules in the central lines.

1. CHALINA, Bowerb. B. Sp. i. 208.

Sponge branched, palmate, or inosculated. Skeleton of solid cylindrical horny fibres, with small imbedded spicules. Spicules fusiform or needle-like, slender, and thick.

CHALINA OCULATA, Bowerb. B. Sp. p. 360. f. 262.

Spongia lavigata, Montag.

Halichondria oculata, Johnston.

B.M.

See other species described by Dr. Bowerbank (Brit. Sp. p. 361).

2. ISODICTYA.

Network of sponge symmetrical, with radiating and transverse lines of fusiform needle-like spicules. Spicules fusiform or needle-shaped. The ovisac internal, membranaceous, not spinose.

Isodictya, Bowerb. B. Sp. i. p. 197; ii. p. 9; O. Schmidt, Spon. Adriat. Supp. ii. p. 17.

Reniera, sp., Nardo; O. Schmidt.

* *Spicula fusiform, smooth.*

1. ISODICTYA CINEREA, Bowerb. B. Sp. ii. p. 27.

Halichondria cinerea, Johnston.

B.M.

See other species described by Dr. Bowerbank (B. Sp. pp. 275 and following).

** *Spicula needle-like, spinose, flexuous.*

2. ISODICTYA LURIDA, Bowerb. B. Sp. p. 336.

Hal. Northumberland.

3. HALISPONGIA.

Sponge massive, with a reticulated horny skeleton. The larger fibres with irregularly dispersed internal spicula; the small ones without spicula.

Halispongia, Bowerb. B. S. ii. p. 207; O. Schmidt, Sp. Adriat. Supp. ii. p. 9 = *Cacospongia*, sp., A. Schmidt.

HALISPONGIA CAVERNOSA.

Bahama Sponge of Commerce, Bowerbank, B. S. i. p. 207, t. 36. f. 378, ii. p. 13.

4. ACANTHELLA, O. Schmidt, p. 65.

Sponge branched, often spinose, flexuous; fibres compressed; skin sunk, very porous. Spicules cylindrical, elongate, often flexuous, placed longitudinally in the membranes.

1. ACANTHELLA ACUTA, O. Schmidt, p. 65, t. 6. f. 7; Suppl. p. 2, t. 1. f. 1.

B.M.

2. ACANTHELLA OBTUSA, O. Schmidt, p. 65, t. 6. f. 8.

5. TRAGOSIA.

Sponge funnel-shaped or fan-shaped, branches anastomosing, minutely hispid. Skeleton regularly netted.

"The spicula of the primary lines of the skeleton are needle-shaped, with their apices directed inwards; those of the secondary lines are fusiform."

Isodictya, sp., Bowerb. B. S. ii. p. 318.

Halichondria **, Johnst. = *Tragos*, Schweiger, Handb. p. 422.

* *Sponge funnel-shaped, or rarely fan-shaped.*

1. TRAGOSIA INFUNDIBULIFORMIS.

B.M.

Spongia infundibuliformis, Linn. S. N. p. 1296; Esper, Z. t. 57. f. 1, 2.

S. crateriformis, Pallas.

S. calyciformis, Lamk.

S. pocillum, Lamx.

Halichondria infundibuliformis, Flem. B. A. p. 524; Johnston, B. S. p. 105, t. 6. f. 3.

Isodictya infundibuliformis, Bowerb. B. S. ii. p. 317, f. 9.

** *Sponge branched and anastomosing in some places.*

2. TRAGOSIA DISSIMILIS.

B.M.

Isodictya dissimilis, Bowerb. B. S. ii. p. 318.

6. CLATHRIA.

Sponge branched; branches inosculating. Spicules uniform, needle-like, smooth, united in a horny matter.

Grantia, Nardo.

Clathria, O. Schmidt, 57.

1. CLATHRIA COMPRESSA, O. Schmidt, p. 58, t. 6. f. 1 (spicules).

Spongia clathrus, Esper?

B.M.

2. CLATHRIA CORALLOIDES, O. Schmidt, p. 58, t. 5. f. 10, 11.

Grantia coralloides, Nardo.

Spongia coralloides, Esper?

B.M.

7. AXINELLA, O. Schmidt, p. 60.

Sponge tree-like, branched, flexible, and rather elastic. Spicules cylindrical, long, often bent or arched, some acute, others blunt at the end.

Grantia, sp., Nardo.

1. AXINELLA CINNAMOMEA, O. Schmidt, p. 61, t. 6. f. 2.

Grantia cinnamomea, Nardo.

Spicules fusiform and needle-shaped, curved.

B.M.

2. *AXINELLA VERRUCOSA*, O. Schmidt, p. 62, t. 6. f. 3.

Spongia verrucosa, Esper, ii. t. 47. B.M.

(1) Spicules fusiform, bent in the middle, (2) blunt at the end.

3. *AXINELLA CANNABINA*, O. Schmidt, p. 63, t. 6. f. 5. B.M.

4. *AXINELLA FOVEOLARIA*, O. Schmidt, p. 64, t. 6. f. 6. B.M.

The genera *Clathria*, *Raspalia*, and *Axinella* of Dr. O. Schmidt appear to depend chiefly on the external form of the sponge.

8. ASTROSPONGIA.

Sponge stipitate, solitary or branched; surface smooth, when moist very rough and very porous, the outer surface denser; when dry friable. Oscules concave, circular, scattered, surrounded with six or eight small circular pores forming a star; spicules small, subulate in the fibres.

ASTROSPONGIA POLYPOIDES. B.M.

Axinella polypoides, O. Schmidt, Spong. Adriat. p. 62, t. 6. f. 4 (oscles far apart).

Hab. Adriatic.

9. ASTROSTOMA.

Sponge solitary, branched; fibres horny, flexible. Oscules? circular, scattered and concave, sunk in the surface, with eight or ten rays, which are covered with spicules. Spicules small, subulate, in corneous fibres.

Astrostoma, Gray, P. Z. S. 1867, p. 239.

ASTROSTOMA BOWERBANKII, (sponge) Bowerb. B. S. p. 278, t. 20. f. 307 *a*, *b*, 308.

Hab. East Indies.

The oscules are often very close, with two or three in a line nearly united.

I have been enabled, through Mr. Tyler, to examine the original specimens from which Dr. Bowerbank described this species, which is probably a parasite like the genus *Bergia* of Michelotti.

Fam. 7. OPHISTOSPONGIADÆ.

Skeleton horny, reticulated; fibres cylindrical, or more or less flattened and expanded, scattered with external diverging spicules.

* *Spicula diverging from skeleton.*

1. OPHISTOSPONGIA.

Sponge massive. Skeleton with reticulated cylindrical horny

fibres, with single or groups of spicules radiating from its outer surface. Spicules uniform, fusiform or needle-shaped.

Ophistospongia, Bowerb. B. S. ii. p. 378.

OPHISTOSPONGIA AUSTRALIS.

Australian sponge, Bowerb. B. S. i. p. 275, t. 17. f. 288.

See also—

Ophistospongia papilla, Bowerb. B. S. ii. p. 378.

Hab. Guernsey.

2. SERIATULA.

Sponge massive. Skeleton of solid, cylindrical, horny, thick and slender fibres, with small imbedded spicules. Spicules smooth, of three forms—(1) broad needle-shaped, (2) pin-shaped, and (3) fusiform, slender, angularly bent.

SERIATULA SERIATA.

Spongia seriata, Grant.

Chalina seriata, Bowerb. B. S. ii. p. 376, f. 287 (outer surface); O. Schmidt, Supp. ii. t. 167.

3. ECTYON.

Sponge massive, reticulated, of cylindrical horny fibres, with single scattered or groups of diverging spicules. Spicules fusiform, verticillated, spined.

1. ECTYON SPARSUS.

West-India sponge, Bowerb. B. S. i. p. 275, t. 17. f. 289.

Spicules scattered, or in pairs or threes.

Hab. West Indies.

2. ECTYON FASCICULARIS.

West-India sponge, Bowerb. B. S. i. p. 276, t. 17. f. 290.

Spicules grouped together in fascicles.

Hab. West Indies.

3. ECTYON CARPENTERI.

Halichondria?, Carpenter, Microscope, p. 538, f. 267.

Hab. Madagascar.

See *Diplodemia*, Bowerb. B. S. f. 377; but it has armed *orisaes*.

4. ACARNIA.

Sponge parasitic, membranaceous, with erect and recumbent clavate spinose spicules. Spicules subcylindrical or subclavate; ends blunt, covered with spines.

ACARNIA CLIFTONI.

Hymeniacion cliftoni, Bowerb. B. S. i. p. 276, f. 70, 83, 291.

Hab. Freemantle, West Australia (*G. Clifton*).

5. NÆNIA.

Sponge thin, with expanded spreading spicules. Spicules dispersed over the membrane:—1. Fusiform, with a series of rounded distant belts forming ovate knots. 2. Fusiform, blunt, with regular whorls of small spines. 3. Cylindrical, with a large central longitudinal slit on each end.

NÆNIA VERTICILLATA.

Hymeraphia verticillata, Bowerb. B. S. i. p. 268, f. 238–240.

6. RAPHYRUS.

Sponge massive. Skeleton reticulated; fibres formed of numerous fusiform or needle-like spicules, irregularly crowded together without order, and united by a very small quantity of horny matter.

Raphyrus, Bowerb. B. S. i. p. 207, ii. p. 354; O. Schmidt, Spon. Adriat. Supp. ii. p. 18 = *Papillina*, O. Schmidt.

1. RAPHYRUS CELATUS.

Halichondria celata, var. *a*, Johnst. B. S. p. 125.

2. RAPHYRUS GRIFFITHSII, Bowerb. B. S. i. p. 207, t. 13. f. 265, ii. p. 354.

Papillina subera, O. Schmidt, Sp. Adriat. 69, iii. 18. B.M.
Hab. England.

Fam. 8. PHAKELLIADÆ.

Sponge expanded, cup-shaped or flabellate; spicula in bundles, cylindrical, numerous, with a closely netted horny skeleton, forming branched and rebranched lines, which do not inosculate.

The structure was well described by Dr. Grant (Edin. New Phil. Journ. i. p. 349).

PHAKELLIA. (Sea Fan-Sponge.)

Sponge fan- or funnel-shaped, with numerous cylindrical bundles of spicules, which branch and rebranch, radiating to the surface. Spicules fusiform or needle-shaped, often flexuous.

Phakellia, Bowerb. B. S. i. p. 186, ii. p. 7; O. Schmidt, Spon. Adriat. Supp. ii. p. 15.

PHAKELLIA VENTILABRUM, Bowerb. B. S. i. p. 186, t. 33. f. 367, ii. p. 122 (cyathiform); O. Schmidt, Supp. ii. t. 1. f. 16. B.M.

Spongia ventilabrum, Linn. S. N.; Grant, Edinb. N. P. J. i. p. 349, ii. p. 122, t. 2. f. 5.

S. zelandica, Jameson.

S. ventilabriformis, Gray, B. P. p. 359.

Halichondria ventilabrum, Johnst. B. S. p. 107, t. 7.

H. ventilabra, Flem. B. A. p. 523.

Halispongia ventilabra, Blainv.

Spongia xerampelina, Grant.

Var. *Spongia scypha*, Mont. W. Th. ii. p. 107, t. 15. f. 1.
S. foliaceus, Gray.

See also—

Phakellia robusta, Bowerb. B. S. ii. p. 126, f. 367 (fan-shaped).

Subsection 2. Spicular Sponges (SPICULOSPONGIÆ). *Sponge fleshy, more or less strengthened by fasciculated or scattered siliceous spicules, the fascicules being sometimes slightly covered with a thin layer of horny matter. Sarcode generally abundant, granular or fleshy; sometimes it is mucilaginous and early deciduous, as in Euplectella.*

Oxyospongiæ, Duchass. & Michelotti, Spon. Mer Caraïbe.

The three principal families of this group are distinguished by the absence or the presence of certain kinds of spicules; thus the *Esperiadæ* have bihamate “defensive” spicules, whilst the *Tethyadæ* have three-pronged or three-hooked and stellate spicules, and all the kinds are absent in the *Halichondriadæ*.

The *Euplectelladæ* and *Polymastidæ* are distinguished by the textile structure of their tubular body; the former has several kinds of defensive spicula, which are absent in the latter family.

Order III. LEIOSPONGIA, or Unarmed Sponges.

Sponge with all the spicules of the same kind, often varying more or less in size and form, but they are always modifications of the most simple kind of spicules.

The spicules are not all uniform in shape; but, if varying in shape, they all belong to one type of form. Thus they may be either cylindrical, fusiform, needle-shaped or pin-shaped, or any of the intermediate modifications of these shapes, which sometimes insensibly pass into each other. In some of these sponges all the spicules are of one or the other of these modifications; others contain two, and others again all three, of these forms combined together. They are easily known from the sponges of the next order by the entire absence (except in some very rare instances) of any of the spicules that Dr. Bowerbank has called defensive and retentive spicules—that is to say, bihamate, anchorate, birotulate, stellate, or three-pronged spicules.

The fusiform, needle-like, pin-shaped, and cylindrical spicules belong to a series, and these forms gradually pass into each other; that is to say, there are all intermediate forms; sometimes the spicules of one sponge, or even specimen, present more than one form. These spicules are smooth, or partially or entirely spiculated or tuberculated, or they are furnished with smooth or rugose or spinous rings. They are rarely angularly bent in the middle, or curved at each end and bent in the form of an S. I have never seen the two ends bent up on one side, such double-hooked spines belong to the bihamate series, and are generally undeveloped spicules of that form. With

these variations the forms of the spicules afford good specific characters, each species having a single form or a series of variations peculiar to itself.

Fam. 1. HALICHONDRIADÆ.

Sponge massive. Skeleton composed of cylindrical, fusiform, or pin-shaped spicules, often varying in form in the same sponge, variously fasciculated together, or rarely single, and united by a small quantity of horny matter. Sarcode fleshy or granular.

* *Spicules fusiform or needle-like.*

1. RENIERA.

Sponge massive, rugose. Skeleton reticulated, strengthened with spicules. Spicules of one shape, fusiform or needle-like (varying in size).

Reniera, O. Schmidt, Sp. Adriat. p. 72.

Hymeniacidon, Bowerb. Brit. Sp.

RENIERA THOMASII.

Hymeniacidon thomasi, Bowerb. B. Sp. p. 155.

See also—

H. coccinea, Bowerb. ib. p. 156.

H. brettii, Bowerb. ib. p. 158.

H. fragilis, Bowerb. ib. p. 159.

H. reticulatus, Bowerb. ib. p. 159.

H. fallaciosus, Bowerb. ib. p. 160.

H. albescens, Bowerb. ib. p. 161.

H. lactea, Bowerb. ib. p. 163.

H. membrana, Bowerb. ib. p. 165.

H. caruncula, Bowerb. ib. p. 166, t. 7. f. 372.

H. sanguinea, Bowerb. ib. p. 168. *Spongia sanguinea*, Grant.

H. mammeata, Bowerb. ib. p. 170.

H. consimilis, Bowerb. ib. p. 172.

H. fallax, Bowerb. ib. p. 177.

H. viridans, Bowerb. ib. p. 178.

H. perlevis, Bowerb. ib. p. 179. *Spongia perlevis*, Mont. (spicules subpin-shaped).

H. aurea, Bowerb. ib. p. 181. *Spongia aurea*, Mont.

H. armatura, Bowerb. ib. p. 183.

H. pachyderma, Bowerb. ib. p. 184.

H. crustula, Bowerb. ib. p. 185 (spicules subpin-shaped).

H. virgultosa, Bowerb. ib. p. 193.

Reniera aqueductus, O. Schmidt, Sp. Adriat. p. 73, t. 7. f. 6. B.M.

R. cratera, O. Schmidt, ib. f. 7. B.M.

R. alba, O. Schmidt, ib. f. 8.

R. nigrescens, O. Schmidt, ib. p. 74. B.M.

R. palmata, O. Schmidt, ib. p. 74. ? *Spongia palmata*, Solander & Ellis. B.M.

- R. semitubulosa*, O. Schmidt, ib. p. 75. ? *Spongia semitubulosa*,
Lamk. B.M.
R. luxurians, O. Schmidt, ib. p. 76. B.M.

2. HALICHONDRIA.

Skeleton irregularly netted, scattered, or reticulated. Spicules uniform, fusiform.

HALICHONDRIA PANICEA, Johnston ; Bowerb. Brit. Sp. p. 229, f. 300, 303.

See also —

H. servosa, Johnston.

H. glabra, Bowerb. ib. p. 232.

H. caduca, Bowerb. ib. p. 234.

H. inconspicua, Bowerb. ib. p. 236.

H. incerta, Bowerb. ib. p. 237.

H. coalita, Johnst. t. 12. f. 1 ; Bowerb. ib. p. 238.

H. simplex, Bowerb. ib. p. 246.

H. subdola, Bowerb. ib. p. 247.

H. farinaria, Bowerb. ib. p. 269 (spicules spined).

H. distorta, Bowerb. ib. p. 240 (spicules fusiform and needle-like).

3. DICTYOCYLINDRUS.

Sponge arborescent ; branches large, forked, rather hispid ; skin without spicules. Skeleton of fasciculated spicules. Spicules :—
1. Needle-shaped or fusiform, long, slender. 2. Needle-like or sub-pin-like, spinose.

Dictyocylindrus, Bowerb. B. S. i. p. 185.

1. DICTYOCYLINDRUS HISPIDUS, Bower. B. S. i. p. 185, ii. p. 108.

Spongia hispida, Mont.

2. D. VENTILABRUM, Bowerb. ib. ii. p. 100, f. 66.

3. D. RAMOSUS, Bowerb. ib. ii. p. 103, f. 366.

4. D. PUMILUS, Bowerb. ib. ii. p. 114.

5. D. RUGOSUS, Bowerb. ib. ii. p. 119, f. 369.

And other species described by Dr. Bowerbank.

4. AAPTOS.

Sponge fleshy, internally spiculose. Spicules all needle-shaped, elongate, smooth (no anchorate spines, or globules, or stars).

AAPTOS ADRIATICA.

B.M.

Ancorina aaptos, O. Schmidt, Supp. i. p. 33, t. 4. f. 4.

Hab. Adriatic.

5. HALISARCA.

Sponge expanded, smooth, gelatinous. Spicules of two kinds:—
1. Cylindrical, very slender, flexuous. 2. Slender, needle-like, spinose.

HALISARCA DUJARDINII, Johnston.

B.M.

Hymeniacidon dujardinii, Bowerb. B. S. ii. p. 224.

6. LIEBERKUHNIA.

Sponge funnel-shaped, turbinate or globose. Texture entirely reticulated. Spicules small, slightly arched, pointed at each end, placed in series forming the fibres.

Lieberkuhnia, Balsamo-Crivelli, 1863; O. Schmidt, Supp. i. p. 43.

LIEBERKUHNIA AGAGROPHLA, Balsamo, *l. c.*

B.M.

Lieberkuhnia calix, O. Schmidt, Supp. ii. p. 43.

Espera calix, Nardo.

Reniera calix, O. Schmidt, i. p. 76, t. 7. f. 12.

7. TEDANIA.

Sponge lobed, crested, with a lateral tube ending in an open mouth. Spicules of three kinds:—1. Clavate, needle-shaped. 2. Fusiform, very slender, elongate, sometimes flexuous. 3. Cylindrical, with rather thicker, blunt ends.

1. TEDANIA DIGITATA.

B.M.

Reniera digitata, O. Schmidt, p. 75, t. 7. f. 11.

2. TEDANIA AMBIGUA.

Reniera ambigua, O. Schmidt, Supp. ii. t. 4. f. 8.

8. OROIDEA.

Sponge massive. Spicules cylindrical, with regular whorls of spines, truncated and torn at one end, and attenuated and pointed at the other.

OROIDEA ADRIATICA.

B.M.

Clathria oroides, O. Schmidt, Sp. Adriat. Supp. i. t. 4. f. 2.

9. PRIANOS.

Sponge massive. Spicules of two forms:—1. Cylindrical, blunt and rounded at each end. 2. Cylindrical, slender, angularly bent in the middle.

PRIANOS AMORPHUS.

B.M.

Reniera amorphia, O. Schmidt, Supp. i. t. 4. f. 7.

10. SCHMIDTIA.

Sponge tuberoso, or tuberoso-elongate, more or less pedunculate, single, or two or three coalesced, with a central tube internally hollow. Parenchyma more or less netted. Spicules of five forms, all smooth:—1. Thick, needle-shaped. 2. Fusiform. 3. Slender fusiform, thick. 4. Subcylindrical, curved, blunt. 5. Longer, pointed, angularly bent at the end.

Schmidtia, Balsamo-Crivelli; O. Schmidt, Suppl. i. p. 42.

SCHMIDTIA FICIFORMIS.

Schmidtia ficiformis, *S. clavata*, et *S. dura*, Balsamo-Crivelli, Mem. Soc. Italiana, 1863, vol. v.; O. Schmidt, Suppl. i. p. 42.

Reniera ? dura, O. Schmidt, i. p. 76, t. 7. f. 13. B.M.

11 CRELLA.

Sponge crustaceous, tubercular; pores confined in wedge-shaped areas. Spicules of two kinds:—1. Fusiform. 2. Club-shaped, nodose.

Cribrella, O. Schmidt, p. 70 (not Agassiz).

CRELLA ELEGANS.

Cribrella elegans, O. Schmidt, p. 70, t. 7. f. 1.

12. SOPHAX.

Sponge-coating rough; oscules minute, dispersed. Skin spinulose. Spicules:—1. Needle-like, long, slender, flexuous. 2. Needle-like, minutely spined.

SOPHAX FALLAX.

Microciona fallax, Bowerb. B. S. ii. p. 128.

13. EPICLES.

Sponge-coating thin, smooth. Skin pellucid, without spicules. Spicules of two forms:—1. Needle-like, slender, in widely radiating groups. 2. Subclavate, smooth or covered with minute spines.

EPICLES RADIATUS.

Hymedesmia radiata, Bowerb. B. S. ii. p. 149.

14. EURYPON.

Sponge-coating hispid. Skin spiculated. Spicules of two kinds:—1. Needle-like, long, slender, smooth. 2. Subclavate, spinulated all over.

EURYPON CLAVATUM.

Hymenaphia clavata, Bowerb. B. S. ii. p. 143.

15. BUBARIS.

Sponge-coating cavernous, hispid. Skin spiculose. Spicules of two

kinds:—1. Needle-like, elongate. 2. Cylindrical or subfusiform, vermiculoid, varying in the manner in which they are twisted.

BUBARIS VERMICULARIS.

Hymeraphia vermicularis, Bowerb. B. S. ii. p. 141, f. 5.

16. CIOCALYPTA.

Sponge cylindrical, massive, with numerous attenuated branches, sometimes forked at the tips. Skeleton of compact interlaced spicules, which divide into fascicles near the surface of the branches; the fascicles dilated at the end supporting the outer surface, and having a series of small cavities below the outer coat. Spicules fusiform or needle-like, stout, variable in size.

Ciocalypta, Bowerb. B. S. i. p. 179, ii. p. 81, t. 30. f. 360, 361.

CIOCALYPTA PENICILLUS, Bowerb. B. S. i. p. 188, ii. p. 81.

17. RASALIA.

Sponge incrusting or arborescent, branched. Spicules of two kinds, united by a horny matter:—1. Needle-shaped, thick, tubercular. 2. Pin-shaped, smooth.

RASALIA VIMINALIS.

Raspalia viminalis, O. Schmidt, p. 59, t. 5. f. 12.

B.M.

18. ADOCIA.

Sponge sessile or branching and inosculating, smooth; oscules on the sides of the branches. Skin without spicules. Skeleton rather irregularly netted. Spicules fusiform, stout, short.

ADOCIA SIMULANS.

Isodictya simulans, Bowerb. B. S. p. 308, f. 299.

19. PHILOTIA.

Sponge incrusting, smooth; oscules minute. Skin regularly netted, spiculous. Spicules isolated, forming a network:—1. Fusiform, slender. 2. Cylindrical or needle-shaped.

PHILOTIA VARIANS.

Isodictya varians, Bowerb. B. S. ii. p. 281, f. 309.

**** *Spicules pin-shaped.***

20. ABILA.

Sponge branched, flexible. Spicules united with horny matter, of three kinds:—1. Pin-shaped, smooth; head rather marked, large. 2. Pin-shaped, nodulous, small. 3. Fusiform, very slender, arched or doubly arched.

ABILA FREYERII.

Raspalia freyerii, O. Schmidt, p. 60, t. 5. f. 13. B.M.

21. SUBERITES, Nardo; O. Schmidt, p. 65.

Sponge massive, compact, fleshy, smooth, sometimes with projecting spicules. Skin with or without spicules. Spicules pin-shaped, fasciculated; fascicules often expanding near the surface.

† *Skin without spicules.*

1. SUBERITES SUBERIA.

B.M.

Spongia suberia, Montag.

Halichondria suberica, Fleming.

H. suberea, Johnston.

Hymeniacidon suberea, Bowerb. B. S. p. 200, f. 23.

2. SUBERITES CARNOSEA.

B.M.

Halichondria carnosa, Johnst.

Hymeniacidon carnosa, Bowerb. B. S. p. 203.

3. SUBERITES GELATINOSA.

Hymeniacidon gelatinosa, Bowerb. B. S. ii. p. 222.

†† *Skin with spicules like the flesh.*

4. SUBERITES SULPHUREA.

Hymeniacidon sulphurea, Bowerb. B. S. ii. p. 208.

††† *Spicules in skin and flesh spinose.* Flacius.

5. SUBERITES CLAVIGERA.

Hymeniacidon clavigera, Bowerb. B. S. p. 211, f. 83.

22. FICULINA.

Sponge massive; surface even; oscules few, large. Skin thin, granular, spiculose. Spicules of three kinds:—1. Pin-shaped. 2. Fusiform. 3. Cylindrical, with central knobs, straight or rather angularly bent.

FICULINA FICUS.

B.M.

Halichondria ficus, Johnston.

Hymeniacidon ficus, Bowerb. B. S. ii. p. 206, f. 95.

See *Isodictya anomala*, Bowerb. B. S. ii. p. 293, f. 4.

23. RASPALIA.

Sponge —? Spicules short, thick, pin-shaped, nodulous.

Raspalia, Nardo; O. Schmidt, Sp. Ad. p. 59 (part.).

RASPALIA TYPICA, Nardo; O. Schmidt, p. 59, t. 4. f. 1. B.M.

24. RAPHIOPHORA, Gray, B. M. 1840.

Sponge cup-shaped, friable, with a harder external case; pores minute. Spicules pin-shaped, fasciculated.

RAPHIOPHORA PATERA.

B.M.

Spongia patera, Hardwicke, Asiatic Researches, xi. p. 180, 1822; Férussac, Bull. Sci. Nat. viii. p. 165, 1826.

Alcyonium poculum (*Neptune's cup*), "Everard Home, MSS.;" Stutchbury, British Institution, on a plate by W. H. Bailly.

Hab. Sumatra (*Raffles*); Singapore (*Hardwicke*).

25. SPINULARIA.

Sponge massive, depressed, minutely hispid. Oscules terminal, slightly raised. Spicules of two kinds:—1. Fusiform, sometimes curved. 2. Pin-shaped; head ovate.

SPINULARIA TETHEOIDES.

Tethea spinularia, Bowerb. B. S. ii. p. 94, f. 25.

26. ANTHO.

Sponge massive. Spicules of three forms:—1. Thick, pin-shaped, rugulose. 2. Thick, cylindrical, torn at the apices. 3. Elongate, needle-shaped, smooth.

ANTHO INVOLVENS.

B.M.

Myxilla involvens, O. Schmidt, Supp. i. p. 37, t. 4. f. 6.

27. PITALIA.

Sponge amorphous. Spicules:—1. Pin-shaped or subclavate, stout, tubercular. 2. Pin-shaped, slender, slightly curved. 3. Cylindrical, slender, clavate, and rounded at each end.

PITALIA FRONDICULATA.

B.M.

Reniera frondiculata, O. Schmidt, Sp. Ad. Supp. t. 4. f. 10.

Fam. 2. CLONIADEÆ.

"Forming excavations in shells and limestone. Cavity multilocular, united by a small tube, forming a dichotomous or anastomosing line of cells, and the inner surface shagreened or punctured. The sponge fills the entire cavity and ramifications, and the oscules and papillæ correspond in size, number, and position with the external orifices on the surface of the shell or stone enclosing the sponge."—*Hancock*.

The oscules and pores contractile. The pores when expanded prominent, above the surface of the shell, top flat, with a radiated opening. The oscules conical, tubular, with an open mouth.

Cliona, Grant; Leidy, Proc. Acad. N. S. Philad. viii. p. 162, 1856; Hancock, Ann. N. H. iii. p. 321 (1849), iv. p. 355 (1849);

Morris, Ann. N. H. iv. p. 239; Bianconi, Nuov. Ann. Sci. Nat. Bologna, vi. p. 455, 1841.

Vioa, H. Michelin, Revue Zoolog. 1841, p. 56 (not 1833); O. Schmidt; Duchass. & Michel. Sp. Caraïb. p. 112.

Spongia terebrans, Duvernoy, Compt. Rend. A. S. Paris, ii. 1841, pp. 683 & 1021; Lereboullet, Instit. ix. 1841, p. 131.

Hymeniacidon, sp., Bowerb. B. Sp.

Oxyspongia perforantes, Duchass. & Michelot. Sp. Mer Caraïbe, p. 112.

Not *Vioa* of Nardo, Isis, 1833, p. 523, who cites *Alcyonium asbestinum*, Linn., as the type, which is a zoanthoid coral.

1. CLIONA.

Spicules uniform, pin-shaped, smooth.

CLIONA CELATA, Hancock, Ann. & Mag. N. H. 1867, xix. p. 237, t. 7. f. 7. B.M.

Hymeniacidon celata, Bowerb. B. S.

Hab. Europe.

See also—

Cliona gorgonoides, Hancock, l. c. p. 237.

C. globulifera, Hancock, l. c. p. 240, t. 8. f. 3.

Vioa viridis, O. Schmidt, p. 77, t. 7. f. 14. B.M.

2. PIONE.

Spicules of three forms:—1. Pin-shaped, smooth. 2. Fusiform, spinulose. 3. Cylindrical, sinuous, smooth, slightly or strongly spinulose.

PIONE NORTHUMBRICA.

Cliona northumbrica, Hancock, l. c. p. 237, t. 7. f. 1.

Hab. Scotland and Northumberland.

See also—

Cliona vastifica, Hancock, l. c. p. 237, t. 7. f. 2.

C. corallinoides, Hancock, l. c. p. 238, t. 7. f. 3.

C. gracilis, Hancock, l. c. f. 4.

C. howsei, Hancock, f. 5.

C. mazatlanensis, Hancock, p. 240, t. 8. f. 1.

3. MYLE.

Spicules of three kinds:—1. Pin-shaped, smooth, head globular, terminal. 2. Fusiform, thick, smooth, sometimes angularly bent, with a swollen belt at the angle. 3. Oblong, fusiform, small, spinulose.

MYLE CARPENTERI.

Cliona carpenteri, Hancock, l. c. t. 8. f. 4.

Hab. Mazatlan.

4. SAPLINE.

Spicules of two kinds:—1. Pin-shaped, elongate, smooth. 2. Fusiform, smooth.

SAPLINE GRANTII.

B.M.

Vioa grantii, O. Schmidt, p. 78, t. 7. f. 15.

Hab. Adriatic.

5. IDOMON.

Spicules of two kinds, angularly bent in the centre:—1. Pin-shaped, head small. 2. Needle-shaped, one end truncate.

IDOMON ALDERI.

Cliona alderi, Hancock, l. c.

6. JASPIS.

Spicules of two kinds:—1. Fusiform. 2. Stellate.

JASPIS JOHNSTONII.

Vioa johnstonii, O. Schmidt, p. 78, t. 7. f. 17.

B.M.

Hab. Adriatic Sea.

7. PRONAX.

Spicules of two kinds:—1. Pin-shaped, head subterminal. 2. Cylindrical, bent or sinuous, smooth or spinose.

PRONAX LOBATA.

Cliona lobata, Hancock, l. c. p. 239, t. 7. f. 6 (bent spicules spinose).

Hab. Newcastle-on-Tyne.

See also, with bent spicules smooth—

Cliona vermifera, Hancock, l. c. t. 8. f. 2.

C. alderi, Hancock, p. 239.

8. SAMUS.

Spicules of one kind, thick, stellate, many-rayed; rays in several series.

SAMUS ANONYMA, Bowerb. B. S. p. 234, t. 2. f. 41, 42.

See *Axus clifftoni* (Bowerb. B. S. f. 197) in *Tethyidæ*.

See also—

Vioa duvernoyii, Duchass. Anim. Radiat. p. 27; Spong. Mer Car. p. 117, t. 25. f. 4.

V. dissociata, Duchass. ib. p. 27; Sp. Mer Car. p. 117, "t. 22. f. 5, 6" (t. 25. f. 5, 6?).

V. strombi, Duchass. Sp. Mer Car. p. 113.

Also the genus *Euryphyllæ*, which perforates the substance of madrepores, forms irregular galleries with granules and spicules.

Euryphyllæ latens, Duchass. Sp. Mer Car. p. 114, t. 25. f. 7, 8.
E. dubia, Duchass. ib. t. 25. f. 5, 6.

Fam. 3. POLYMASTIADÆ.

Sponge massive, with numerous open-mouthed erect tubes. Skeleton of the base of divergent fascicules of spinules; of the tubes formed of longitudinal and transverse fascicules of slender cylindrical elongated spicules.

Polymastica, Bowerb. B. S. i. p. 371.

1. PENCILLARIA.

Spicules of the mass pin-shaped. The transverse fibres separate.

PENCILLARIA MAMMILLARIS.

Polymastica mammillaris, Bowerb. B. S. i. p. 178, ii. p. 571; O. Schmidt, Sp. Adriat. Supp. ii. t. 1. f. 12.

Spongia mammillaris, Müller, Z. D. t. 158. f. 3, 4. B.M.

S. pencillus, Montag W. Trans. p. 93, t. 13. f. 7.

2. POLYMASTICA, sp., Bowerb. B. S.

Spicules needle-shaped. The transverse fibres fasciculated.

POLYMASTICA ROBUSTA, Bowerb. B. S. i. p. 178, t. 29. f. 358, ii. p. 63.

Alcyoncellum robustum, Bowerb. ib. i. p. 172, f. 257, 258.

See also—

P. ornata, *P. bulbosa*, *P. brevis*, and *P. radiosa*, Bowerb. ib. ii. pp. 59, 61, 64, 68.

Order IV. ACANTHOSPONGIA (Armed or Hooked Sponges).

Sponge strengthened with various-shaped spicules, besides the usual simple fusiform or needle-like spicules of the preceding order.

These sponges, besides having the cylindrical fusiform needle-like or pin-shaped spicules found in the preceding order, are provided with various shaped spicules, which are usually armed with some form of hook or extended prickles that form a means of defence. These defensive spicules vary considerably in shape, being either bihamate, anchorate, three-pronged, or star-like; and the various modifications of these forms are present in the different genera.

Fam. 1. EUPLECTELLADÆ*.

Sponge tubular, isolated, with the tubes closed at the top with a netted lid. The skeleton of the tubes formed of bundles of elon-

* Professor Wyville Thompson, to whom I am indebted for the photographs of the species of this family in the Paris Museum here copied, in a letter, dated 22nd of May, 1867, observes, "As to the *Euplectella*, the two species (two species

gated cylindrical thread-like spicules placed in a longitudinal, transverse, and oblique direction, crossing each other, and forming a more or less regular network. Sarcodæ scattered with stellate spicules, with the rays more or less divided.

- A. *Tube formed of longitudinal and transverse bundles of filiform spicules, intersected with more slender oblique series of spicules, and strengthened externally with transverse or oblique raised ridges, the upper ridge forming a fringe between the end of the tubes and the irregularly netted lid; the base of the tubes surrounded with free filiform spicules, barbed at the end.*

1. EUPLECTELLA.

The tubes regular, gradually wider above, formed of regular longitudinal and transverse bundles of filiform spicules, which are crossed in an oblique direction with more slender fascicules or separate filiform spicules, and strengthened externally with transverse or oblique elevated ridges; the upper ridge forming a fringe at the top of the tubes, between the edge of the tubes and the irregularly netted lid. Sarcodæ thin, studded with many-rayed stellate spicules, with long simple or trifid rays, or with short rays divided at the end into several converging rays, forming a bell-shaped series.

The fringe on the end of the tube, between it and the lid, is only found in the perfectly grown sponges; it is very small in the specimens of *E. aspergillum* that are not quite of the normal form—that is,

I certainly believe them to be) of the Jardin des Plantes are very closely allied. It is not easy at first to catch a good microscopic character. Still there is a difference in the form of the small spicules especially. These two species are, however, utterly different from our *Euplectella aspergillum*. It would be impossible to put the three even in the same genus. In the French species the network of the wall is formed entirely of perfectly free spicules, very long, simply interwoven, never anastomosing, held together by sarcodic substance alone, and perfectly easily shaken separate by a needle or a hair-pencil in a drop of water. The spicules are exactly of the same type as those of *Hyalonema*, and are netted together precisely in the same way; in fact the French species would fit much better into the genus *Hyalonema* than into *Euplectella*. They will not go into either genus, however, and either you or I must concoct a special generic name for them.

"*Eup. aspergillum*, again, reminds one strongly of the work you must have often seen—ships, baskets, &c., made of spun-glass, by heating and netting it in and out in all directions, attaching constantly the various points of contact. Thus, while *aspergillum* is made quite rigid, the French species are absolutely flexible, only firm enough to maintain their form.

"It seems to me that we have now a series forming a very remarkable group, graduating through *Aphrocallistes*?, *Hyalonema*, the French genus, *Euplectella* (*aspergillum* and *cucumer*), into *Iphileon* and *Dactylocalyx*. In these the form is very different certainly; but the general plan of the small free spicules is the same, and the interlacing siliceous tubing is very much as in *Eup. aspergillum*.

"Schultze's proposed group 'Lophospongiæ' cannot stand. It is founded upon the long free spicules merely, and would only contain *Hyalonema* and *Euplectella*, excluding *Aphrocallistes* and the French genus, which seem to me most characteristic members of the series.

"By-the-by could you give me a shred of *Aphrocallistes*, I should like to compare the small spicules."

to say, in those that have an irregular edge to the upper part of the tube, or other deformities of growth.

Euplectella, Owen, Trans. Zool. Soc. iii. p. 203, 1841.

Alcyoncellum, Bowerb. B. Sp. i. p. 176 (not Blainville, nor Quoy and Gaimard).

The texture of *Euplectella* has been compared to woven lace. The threads of the *Euplectella* were not first spun and then interwoven as in the case of human manufacture, but were formed as interwoven, the two processes going on simultaneously, or *pari passu*; and this is further shown by the fact that, in a specimen that had been pierced, the hole is filled up with interwoven fibres like a darn. It is to be recollected that the beautiful object which we have in our cabinet is but the skeleton of the sponge; and in its living state this exquisite flinty framework is veiled by a delicate gelatinous enveloping organic tissue (see Owen, Trans. Linn. Soc. xxii. p. 121).

1. EUPLECTELLA ASPERGILLUM, Owen, Trans. Zool. Soc. iii. p. 203, t. 13 (upside down). B.M.

Euplectella speciosa, Gray, Ann. & Mag. N. H. 1866, xviii. p. 487.

Alcyoncellum aspergillum, Bowerb. B. S. i. p. 177, f. 174, 175, to p. 184, f. 186, 189, 193, 194, 198, 253, 356, 357.

Hab. Philippine Islands (*Cuming*).

This species is liable to several variations; its form is sometimes short, ovate, and straight like the following; the regular longitudinal and transverse bundles of spicules are distinctly marked, indeed more so in the young specimens only a few inches long than in the adult.

There is a good series of varieties of different ages in the British Museum.

2. EUPLECTELLA CUCUMER, Owen, Trans. Linn. Soc. xxii. p. 117, t. 21; Bowerb. B. S. i. p. 237. f. 59.

Hab. Seychelle Islands (*Capt. Etheridge*).

Only known from the single specimen in the collection of Dr. Farre. The absence of the fringe and the small size of the transverse ridges may be dependent on the age or imperfect development of the specimen, for that is the peculiarity of the younger specimen from the Philippines.

I have not seen the specimen; but Dr. Bowerbank, who has examined it and its spicules, informs me that he regards it as only a variety of *E. aspergillum*; but the difference in the locality and the peculiar form leads me to believe that it is a distinct species; and I hope Dr. Perceval Wright, who has gone to the Seychelles to study the natural history of those little-known islands, will bring home specimens that may determine this and other interesting zoological questions.

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- B. *Tube formed of fascicules of filiform spicules placed in various directions, forming an irregular network like the lid of the tube, and not strengthened with any raised transverse or oblique ridges or fringe at the edge of the aperture, and without any free barbed filament at the base.*

2. CORBITELLA.

The tube clavate, rather irregular, rounded at the end, formed of slender fascicules of open elongate filiform spicules, placed in longitudinal, transverse, and oblique directions, forming an irregular network.

Alcyoncellum, Quoy & Gaim. (not De Blainville).

Euplectella, sp., Gray, Ann. & Mag. N. H. 1866.

This genus chiefly differs from *Euplectella* in the want of the well-marked longitudinal and transverse bundles of spicules, which are to be observed in all the specimens of different ages of *E. aspergillum* that have come under my observation.

CORBITELLA SPECIOSA. (Pl. XXVIII. fig. 1.)

Alcyoncellum speciosum, Quoy & Gaim. Voy. Astrol. p. 302, Zoophytes, t. 26. f. 3, 1833 (very bad); Lamk. An. s. Vert. ed. 2, ii. p. 589; Bowerb. B. S. f. 185, 187, 188, 195?

Hab. Molucca (*M. Merkus*; *Mus. Paris*).

Quoy and Gaimard thus describe the only specimen of this sponge yet known in Europe:—"Cette singulière production représente un cylindre creux, de sept à huit pouces d'étendue, en forme de *Phallus*, arrondi et un peu dilaté à une extrémité, ouvert à l'autre, à parois minces, formée de filets très déliés, lâchement accolés les uns aux autres, entrecroisés dans tous les sens, de manière à former de nombreuses mailles arrondies, presque régulières comme celles de la dentelle ou bien des sièges tissés en rotang."—*Zoophytes*, ii. p. 303.

Professor Wyville Thompson has most kindly sent me a photograph of this specimen, which is here copied (Pl. XXVIII. fig. 1), and which shows that it is quite distinct from the Philippine Sponge.

MM. Quoy and Gaimard's figure is very imperfect, and probably misled Prof. Owen; for he observes, when describing *Euplectella aspergillum*, that "If the basal aperture of the cone were open, the resemblance to some of the known Alcyonoid sponges would be very close, especially to that called *Alcyonellum gelatinosum* by M. De Blainville (*Alcyonellum speciosum*, Quoy & Gaim.); its closure by the reticulate convex frilled cap in the present instance establishes the generic distinction."—*Trans. Zool. Soc.* iii. p. 205.

But the specimen figured by MM. Quoy and Gaimard has a "reticulate convex cap." And this is not the only mistake in this paragraph; the "basal aperture" is the apex of the sponge. *Alcyonellum gelatinosum* (which should be *Alcyoncellum gelatinosum*, Blainville) has no affinity to *Alcyoncellum speciosum* of Quoy and

Gaimard, one being a large conical siliceous sponge, and the other a small branched calcareous one. And why are these sponges called Alcyonoid? They have no affinity to *Alcyonium*, which are true zoophytes.

3. HETEROTELLA.

The tube short, rather irregular, conical, truncated, irregularly netted. Skeleton formed of thick bundles of very numerous slender spicules, placed in all directions, and forming an irregular network, similar to the network of the lid of *Euplectella*.

HETEROTELLA CORBICULA. (Pl. XXVIII. fig. 2.)

Alcyoncellum corbicula, Valenc. Mus. Paris; Bowerb. B. Sp. i. p. 176.

Hab. Isle De Bourbon.

I am indebted to Prof. Wyville Thompson for having first drawn my attention to the want of the regular longitudinal fascicle of spicules in these two genera, and also for most kindly presenting me with the photographs of the two sponges taken from the specimens in the Paris Museum, which are here copied.

Fam. 2. ESPERIADÆ.

Skeleton composed of fusiform and linear spicules, interspersed with anchorate, bihamate, or birotulate spicules, which are either attached to the membranes or scattered in the sarcode, and form a defence to the sponge.

The *bihamate* and *anchorate* spicula exist in large numbers on the surface of the interstitial membrane. The *bihamate* are fusiform spicula, bent at each end into the form of a hook, the curves being in the same plane or at right angles to each other, the tips are tapering and acute, or sometimes solid and club-shaped; and rarely they are expanded into circular plates.

The *anchorate* spicula always have their two terminations in the same position as those of the bow of an ordinary ship anchor. In some sponges they are tolerably uniform in shape and proportion; while in others they vary exceedingly, not only while in course of development, but even when in their adult condition. They glide so insensibly from one form into another that it is difficult to draw a distinction between them, even when there are a sufficient number of fully developed ones to exhibit the normal form.

In most cases, besides the large and fully developed anchorate spicules, there is found accompanying them a secondary series, which are very much smaller in size, and vary exceedingly both in symmetry and amount of development; they appear to be simply abortive developments of the larger and more perfect of the normal spicula. The *anchorate* spicula are gradually and progressively developed. They are to be found at both sides of the membranaceous skeleton, and are often very minute (see Bowerb. Phil. Trans. 1858, pp. 205, 300, 303).

When the two ends are equally developed they are *equianchorate*, when unequal *inequianchorate*, and the ends are distinguished as bidentate, tridentate, and palmate.

Simple forms of spicula have the same shape from the beginning to the termination of their growth.

Synopsis of sections of family.

- I. Defensive spicules unilateral, inequianchorate, attached to the skeleton.
 - * Flukes entire, with central ridge (Genera nos. 1-4).
 - ** Flukes palmate (Genus no. 5).
 - II. Defensive spicules unilateral, bi- or triplicated, free in the sarcode (Genera nos. 6 & 7).
 - III. Defensive spicules unilateral, equianchorate, free in the sarcode.
 - * Flukes divided into two or three spines at each end (Genera nos. 8-19).
 - ** Flukes oblong, concave, with a central apical tubercle (Genus no. 20).
 - *** Flukes cup-shaped, acute at each side (Genus no. 21).
 - **** Spicules boat-shaped, with marginal sides (Genus no. 22).
 - IV. Defensive spicules compressed, bihamate, hooked at each end (Genus no. 23).
 - V. Defensive spicules bihamate or contorted only (Genera nos. 24-30).
 - VI. Defensive spicules regular, with rotate rays at each end (Genus no. 31).
- I. *Defensive spicules unilateral, inequianchorate, attached to the skeleton.*

* *Flukes entire, with a single central ridge, with a spine at its base.*

1. *ESPERIA*, Nardo (part.), O. Schmidt, p. 54.

Sponge branched, flexible, netted. Spicules of three kinds, united in the horny matter:—1. Pin-shaped. 2. Bihamate—that is, slender, cylindrical, bent up at each end, regular or tortose. 3. Equianchorate, minute; flukes ovate, with a central ridge ending in a spine below.

ESPERIA TYPICA, Nardo.

Esperia contavenii, O. Schmidt, p. 54, t. 5. f. 2 (pin-shaped spicules, double-headed, with a subbasal cross bar). B.M.

Hab. Adriatic.

<i>Esperia foraminosa</i> , O. Schmidt, p. 54, t. 5. f. 3.	B.M.
? <i>E. bauriana</i> , O. Schmidt, p. 55.	B.M.
<i>E. tunicata</i> , O. Schmidt, p. 55, t. 5. f. 4.	B.M.
<i>E. bowerbankii</i> , O. Schmidt, p. 55.	
<i>E. anceps</i> , O. Schmidt, t. 5. f. 5.	
<i>E. syrinx</i> , O. Schmidt, p. 56, t. 5. f. 6.	B.M.
<i>E. lorenzi</i> , O. Schmidt, p. 56, t. 5. f. 7.	B.M.
<i>E. massa</i> , O. Schmidt, p. 56, t. 5. f. 8.	B.M.
<i>E. modesta</i> , O. Schmidt, p. 57, t. 5. f. 9 (called <i>Clathria coraloides</i> in explanation of plates).	B.M.
<i>E. volutata</i> , O. Schmidt, p. 57.	
<i>E. nodosa</i> , O. Schmidt, Supp. i. p. 33, t. 3. f. 10.	B.M.
<i>E. basillaris</i> , O. Schmidt, Suppl. i. p. 34. t. 3. f. 12.	B.M.

2. MYCALE.

Sponge massive, sessile. Oscules dispersed. Skin spiculose. Spicules of three kinds:—1. Inequianchorate, of two sizes; larger in radiating groups, flukes cordate, with a central ridge, sides of flukes dilated, curled up on the sides and produced below; smaller dispersed. 2. Fusiform, needle-like. 3. Bihamate, simple and contorted, minute.

MYCALE LINGUA.

B.M.

Hymeniacion lingua, Bowerb. B. S. ii. p. 187, f. 147, 148, 297.

See also—

Mycale grandis, O. Schmidt, Supp. t. 3. f. 11.

Hab. India. Flukes triangular, hastate.

3. ÆGOGROPILA.

Sponge massive or coating, rugose. Oscules large, dispersed. Skin spiculose. Skeleton reticulated; fibres formed of bungled spicules. Spicules of four kinds:—1. Fusiform, needle-like, or subclavate. 2. Contorted and reversed, bihamate. 3. Inequianchorate, bidentate. 4. Fusiform, tricurvate.

ÆGOGROPILA VARIANS.

Halichondria ægogropila, Johnston.

Desmacidon ægogropila, Bowerb. B. S. ii. p. 352, f. 264.

4. MENYLLUS.

Sponge sessile, closely laticed by round inosculating branches, minutely hispid. Skin with slender fusiform spicules, fasciculated and forming a coarse irregular network. Spicules of three kinds:—1. Slender, needle-like or fusiform, partially spined. 2. Inequianchorate, angulated. 3. Bihamate, malformed.

MENYLLUS INGALLI.

Halichondria ingalli, Bowerb. B. S. ii. p. 258, f. 29, 30.

**** *Flukes divided into several palmate hooks.***

5. GRAPELIA.

Sponge —? Spicules inequianchorate, in circular groups; the flukes divided into several unilateral palmate hooks.

GRAPELIA AUSTRALIS, Bowerb. B. S. f. 135.

Hab. West Australia.

II. *Defensive spicules unilateral bipolicated and inequianchorate, free in the sarcode.*

6. ALEBION.

Sponge branching, anastomosing; branches compressed, corymbose, rather hispid or parasitic. Spicules:—1. Inequianchorate, bidentate. 2. Needle-like, spined. 3. Cylindrical, slender, flexuous. 4. Equianchorate, bipolicated.

ALEBION HYNDMANI.

Halichondria hyndmani, Bowerb. B. S. p. 264, f. 123–127.

See also—

?*Alebion australis*, Bowerb. ib. f. 131–134.

Hab. West Australia. With triplicated unilateral spines.

7. IOPHON.

Sponge parasitic, smooth. Oscules dispersed. Skin spiculose. Spicules:—1. Fusiform, cylindrical, spined. 2. Simple, bipolicated, anchorate. 3. Inequianchorate, dentate, palmate, and bidentate.

1. IOPHON SCANDENS.

Halichondria scandens, Bowerb. B. S. ii. p. 259.

2. IOPHON NIGRICANS.

Halichondria nigricans, Bowerb. ib. p. 266, f. 282.

III. *Defensive spicules unilateral, equianchorate, free in the sarcode.*

*** *Flukes divided into two or three spines at each end.***

8. ISODICTYA, sp., Bowerb. B. S. i. p. 197.

Sponge sessile, minutely hispid, regularly reticulated. Spicules of three kinds:—1. Needle-shaped, fusiform. 2. Bihamate, bicalcarate (Bowerb. f. 121). 3. Equianchorate or palmate.

ISODICTYA NORMANI, Bowerb. ib. ii. p. 320, f. 121, 376 (type).

See also—

Isodictya edwardsii, Bowerb. ib. p. 325.

I. paupera, Bowerb. ib. p. 328.

I. palmata, Bowerb. ib. p. 311.

9. EMPLOCUS.

Sponge incrusting, parasitic on *Sertularia*. Spicules of four kinds:—1. Cylindrical, pin-shaped, both ends truncated, torn, smooth. 2. Cylindrical, slightly tubercular, with one or three diverging conical points at one end, and irregularly truncated at the other. 3. Cylindrical, curved, rather swollen, rounded at the ends, with two elongate spines at each side of ends. 4. Equibianchorate, two-pointed at each end.

EMPLOCUS TRIDENS.

Myxilla tridens, O. Schmidt, Supp. t. 4. f. 5.

B.M.

10. ANCHINOË.

Sponge-coating thin, smooth. Oscules slightly elevated. Skin spiculose. Spicules:—1. Fusiform, large, long. 2. Clavate, slender, entirely spined, of various sizes. 3. Equianchorate, bi- or tridentate.

ANCHINOË PERARMATUS.

Hymeniacidon perarmatus, Bowerb. B. S. p. 164.

11. MICROCIONA, part., Bowerb. ib. i. p. 188, ii. p. 124.

Sponge thin; coating with columns of spicules that radiate from the axis in every direction. Spicules of three kinds:—1. Subclavate. 2. Needle-shaped, spined. 3. Equianchorate, bidentate (or dentato-palmate).

Scopalina, O. Schmidt.

MICROCIONA SPINULENTA, Bowerb. B. S. p. 132.

See also—

M. armata, Bowerb. ib. p. 129.

M. fictitia, Bowerb. ib. p. 124.

M. carnosus, Bowerb. ib. p. 133.

M. atrosanguinea, Bowerb. ib. p. 138. *Scopalina lophyropoda*,
O. Schmidt. B.M.

? *M. ambigua*, Bowerb. ib. p. 136 (end of anchorate spicules sometimes dentato-palmate).

12. DENDORYX.

Sponge massive, irregularly reticulated. Spicules of four kinds:—1. Fusiform or cylindrical, pointed at each end, smooth. 2. Needle-like, spinulose all over. 3. Equibianchorate, three-spined at each end. 4. Bihamate.

DENDORYX INCRUSTANS.

Halichondria incrustans, Bowerb. ib. p. 249, f. 28, 92, 110, 111, 373; O. Schmidt, Supp. ii. t. 1. f. 17.

See also—

H. thompsoni, Bowerb. B. S. p. 243.

- H. albula*, Bowerb. ib. p. 268.
H. irregularis, Bowerb. ib. p. 252.
H. dickiei, Bowerb. ib. p. 253.
H. pattersoni, Bowerb. ib. p. 255.
H. batei, Bowerb. ib. p. 261.
H. granulata, Bowerb. ib. p. 262.

13. PRONAX.

Sponge sessile, rugose, and mammillated. Skin irregularly spiculate. Spicules of four kinds:—1. Fusiform, large. 2. Equianchorate, ending in three more or less unequal angulated spines, arranged in circular groups or dispersed. 3. Needle-like, stout, spined, rarely spineless. 4. Fusiform, spined.

PRONAX PLUMOSA.

B.M.

Spongia plumosa, Montag.

Hymeniacidon plumosa, Bowerb. B. S. ii. p. 195, f. 141–143.

14. EUTHYMUS.

Sponge —? Spicules equianchorate, each end ending in three nearly equal-sized attenuated acute lobes or teeth.

1. EUTHYMUS SHADBOLTHI.

Sponge, Bowerb. ib. i. pp. 47, 250, f. 140.

2. EUTHYMUS ? MINOR.

Sponge, Bowerb. ib. ii. p. 250, f. 149.

15. DESMACIDON, part., Bowerb. ib. i. p. 200, ii. p. 345 (type).

Sponge massive, hispid, irregularly netted, with large tubular cloaca; filaments with imbedded longitudinal spicules. Spicules of three kinds:—1. Needle-like. 2. Bihamate, simple, and contorted. 3. Equianchorate, bidentate.

DESMACIDON FRUCTICOSUS, Bowerb. ib. i. p. 200, ii. p. 345; O. Schmidt, Supp. ii. t. 1. f. 19.

16. HAMIGERA.

Sponge thick, subglobose. Pores in sunken oscule-like spaces. Spicules of two kinds:—1. Simple. 2. Equibianchorate, with three spines at each end.

HAMIGERA RUBENS.

B.M.

Cribrella hamigera, O. Schmidt, S. A. p. 70, t. 6. f. 13.

17. HYMEDESMIA, part., Bowerb. B. S.

Sponge-coating very thin, smooth, with fascicules of spicules. Spicules of four kinds:—1. Cylindrical, slender, subclavate at each

end. 2. Needle-shaped, conical, strongly spined all over. 3. Equianchorate, bi- or tridentate. 4. Bihamate.

HYMEDESMIA ZETLANDICA, Bowerb. B. S. i. p. 190, ii. p. 152, f. 296, 371.

18. TEREUS.

Sponge massive, sessile, smooth, regularly reticulated, with a square mesh. Skin spiculose. Spicules of two kinds:—1. Needle-shaped, thick, spinulate all over. 2. Equibianchorate, two-spined, two-fringed, of various sizes.

TEREUS FIMBRIATUS.

Isodictya fimbriata, Bowerb. ib. ii. p. 337, f. 150; O. Schmidt, Supp. ii. t. 1. f. 18.

19. CARMIA.

Sponge-coating thin, smooth. Oscules dispersed. Skin spiculose. Spicules of four kinds:—1. Subclavate, needle-like, and very slender. 2. Fusiform, tricurvate. 3. Inequianchorate, bidentate, or subpalmate. 4. Bihamate, contorted.

1. CARMIA MACILENTA.

Hymeniacidon macilenta, Bowerb. B. S. ii. p. 176.

2. CARMIA FLOREA.

Hymeniacidon florea, Bowerb. ib. ii. p. 190.

** *Flukes oblong, concave, of rather unequal length, with a single central apical tubercle at each end.*

20. CORYBAS.

Sponge-coating lobate or branched, regularly reticulated externally. Skin spiculose. Oscules dispersed. Spicules:—1. Needle-shaped, short, and stout. 2. Needle-shaped, subcylindrical, slender. 3. Bihamate, extra-umbonate. 4. Equianchorate; flukes oblong, concave, with a single central apical tubercle at each end (Bowerb. f. 139).

CORYBAS LOBATA.

Isodictya lobata, Bowerb. B. S. ii. p. 326, f. 139.

*** *Flukes cup-shaped, acute on each side.*

21. INGALLIA.

Sponge —? Spicules:—1. Equianchorate, with a hemispinal cup at each end, abundant, recumbent on the membranes.

INGALLIA CUPULIFERA.

Desmacidon, sp., Bowerb. B. S. i. p. 252, f. 151.

Hab. —?

**** *Defensive spicules oblong, boat-shaped, concave on the sides.*

22. NAVICULINA.

Sponge —? Spicules:—1. Equibianchorate, unilateral, oblong, concave, with a marginal rib on each side, and sometimes a central keel-like one, abundant on membrane near fascicules of slender spicules. 2. —?

NAVICULINA CLIFTONI.

Hymedesmia, sp., Bowerb. B. S. i. p. 252, f. 152.

Hab. West Australia, Freemantle (*Clifton*).

IV. *Defensive spicules equibihamate, compressed, with a sharp edge, hooked at each end, free in sarcode.*

23. HAMACANTHA.

Sponge —? Spicules of two kinds:—1. Needle-shaped, slender. 2. Equibihamate; hooks and inner edge of shaft sharp-edged.

HAMACANTHA JOHNSONI.

Halichondria johnsoni, Bowerb. B. S. i. pp. 35, 127, f. 112, 293.

Hab. Madeira.

V. *Defensive spicules bihamate, simple, or contorted, without any bianchorate ones intermixed.*

24. GELLIUS.

Sponge massive, minutely hispid. Skeleton regularly netted. Spicules of two kinds:—1. Fusiform. 2. Bihamate, simple, and contorted.

1. GELLIUS JUGOSUS.

Isodictya jugosa, Bowerb. B. S. ii. p. 296.

2. GELLIUS ROBUSTUS.

Isodictya robusta, Bowerb. ii. p. 304.

25. BIEMNA.

Sponge massive. Skin rough, spiculose. Skeleton irregularly netted; fibres composed of longitudinal dispersed spicules, covered with a thin coat of horny matter. Spicules:—1. Fusiform. 2. Bihamate, simple, or contorted and reversed.

BIEMNA PEACHII.

Desmacidon peachii, Bowerb. B. S. p. 349.

See also—

Desmacidon constrictus.

D. jeffreysii, Bowerb. ib. pp. 347-350.

Halichondria corrugata, Bowerb. ib. ii. p. 242.

H. candida, Bowerb. ib. p. 251.

H. pulchella, Bowerb. ib. p. 256.

H. inornata, Bowerb. ib. p. 27.

26. ASYCHIS.

Sponge —? Spicules of two forms:—1. Fusiform, large.
2. Fusiform, slender, bihamate, simple (and contorted), large, and small.

1. ASYCHIS FIBULATA.

Reniera fibulata, O. Schmidt, p. 73, t. 7. f. 9.

2. ASYCHIS VARIANTIA.

Halichondria variantia, Bowerb. B. S. f. 11, 409.

Hymeniacion varantia, Bowerb. ib. p. 174.

27. DYMNUS.

Sponge —? Spicules:—1. Simple, bihamate, with an umbo on the inner or outer, or on the inner and outer sides of the middle of the shaft.

DYMNUS SICULUS.

Sponge from Sicily, Bowerb. B. S. i. p. 247, f. 115-117.

28. DAMO.

Sponge —? Spicules bihamate, each of the ends clavate, rounded, blunt (see Bowerb. B. S. f. 118, 119, 120).

DAMO BICLAVATA.

Sponge, Bowerb. ib. i. pp. 44, 247, f. 118-120.

29. ABILA.

Sponge-coating smooth. Oscules minute, dispersed. Skin spinulose. Spicules of three kinds:—1. Fusiform, long, slender, smooth. 2. Fusiform, tricurvate, stout. 3. Fusiform, stout, broad, spined.

ABILA LÆVIS.

Microciona lævis, Bowerb. ib. ii. p. 127.

30. ORINA.

Sponge massive, smooth. Outer skin with a network of spicules. Spicules of two kinds:—1. Fusiform slender. 2. Fusiform truncate.

ORINA ANGULATA.

Halichondria angulata, Bowerb. ib. ii. p. 233.

VI. *Defensive spicules regular, birotulate, with many rays at each end, free in sarcodæ.*

31. CARTERIA.

Sponge massive, irregularly reticulated, shallow, formed of abundant agglutinated filiform needle-like spicules, with four- and six-rayed stellate, cruciform, and birotulate spicules.

Hyalonema, part., Bowerb. ; Schultze ; Brandt (not Gray).

CARTERIA JAPONICA.

Hyalonema mirabilis, Bowerb. B. S. i. p. 237, f. 60-65 ; p. 276, f. 294, 295 ; Schultze, t. 3 & 4 (not Gray). B.M.

Hab. Japan.

Bowerbank's figures (Br. Sp. 153-157) represent the spicules of the corium that surround the filaments of *Hyalonema mirabilis*, Gray, and have nothing to do with the smooth stellate or radiate spicula of this sponge. They have been called *Spongia octancyræ*, Brandt, Hyal. p. 14 ; *Spongia spinicrues*, Brandt, Hyal. p. 23, t. 3. f. 15, 16. They are also figured in Schultze's '*Hyalonema*,' t. 3. f. 9-14.

Fam. 3. TETHYADÆ.

Sponge massive, suborbicular or subramose, fleshy. Skeleton consisting of simple fusiform and of fusiform spicules with three prongs or three diverging hooks at the distal or outer extremity, and with more or less globular many-rayed stellate spicules, or of either of the two kinds.

The stellate spicules are composed of few or many radii, emanating from a centre in all directions. Their simplest form is when the bases of the radii all proceed from a common point ; in others the radii spring separately and distinctly from a common central spherical or oval base.—*Bowerb. Phil. Trans.* 1858, p. 307, 309.

Dr. Bowerbank calls the elongate spicules which are peculiar to *Geodiadæ* and *Tethyadæ* connecting spicula. These spicula have a long, stout, cylindrical, or attenuated shaft, terminating either acutely or hemispherically at the base ; while the apex is divided into three stout equiangular radii, which assume in different species a considerable variety as regards form and direction. The triradiate apices are usually cemented firmly to the inner surface of the crustated coat of the sponge ; while the stout and elongated shaft is intermingled with and firmly cemented by keratode to the general mass of the skeleton. The triradiate apices also serve to construct areas in which are situated the proximal orifices of the intermarginal cavities, which are imbedded in the crustated surface of the sponge.—*Bowerb. Phil. Trans.* 1858, p. 289.

I. *Sponge subglobose, with tricurvate internal spicules supporting the outer surface.*

* *Sponge with stellate spicules on the skin or sarcode.*

1. DONATIA (part.), Nardo, Isis, 1833, p. 522.

Sponge fleshy, subglobose, warty. Spicules of three kinds:—
1. Stellate. 2. Subulate or fusiform, simple. 3. Club-shaped; club conical, truncated, with a conical process on one of the sides.

Tethya, Schmidt, Suppl. p. 43.

DONATIA AURANTIUM, Nardo, Isis, 1833, p. 522.

B.M.

Alcyonium aurantium, Pallas; Esper, t. 19. f. 4-8.

A. lynceurium, Gmelin, S. N. p. 1295.

Spongia verrucosa, Mont. W. Tr. ii. p. 117, t. 13. f. 45.

Tethea lynceurium, Lamk. A. s. V. ii. p. 592; Blainv. M. A. p. 544, t. 91. f. 3?; Johnst. B. Sp. p. 85, f. 13; Bowerb. B. S. ii. p. 92, f. 342; O. Schmidt, S. A. p. 44, t. 4. f. 1-9; Suppl. ii. t. 1. f. 15.

Tethya verrucosa, Gray, B. P. i. p. 362.

T. sphaerica, Fleming, B. A. p. 520.

Hab. Coast of England.

See also—

Tetheya lacunosa, Lamk., Schw. Beob. t. 2. f. 17, 18.

Tetheum pulvinatum, Blainv. Man. d'Actinol. p. 544.

Tethia cavernosa, Lamk. Ann. du Mus. i. p. 71.

Tethya aspestella, Lamk. Ann. du Mus. i. p. 71.

Tethya hispida, Bowerb. Canadian Naturalist, p. 304.

Tethia globosa, Duchass. & Michelot. Sp. Caraïbe, p. 104. Guadeloupe.

2. COLLINGSIA.

Sponge massive, depressed, uneven, rugged. Spicules:—1. Fusiform. 2. Stellate (attenuato- and cylindrico-stellate). 3. Fusiform, ternate, recurved at the tips.

1. COLLINGSIA SARNIENSIS.

Tethea collingsii, Bowerb. B. S. p. 87, f. 48.

2. COLLINGSIA SCHMIDTII.

Tethea schmidtii, Bowerb. ib. p. 89.

3. THENEA.

Sponge massive. Spicules:—1. Simple, not protruded beyond the surface. 2. Large, furcate, ternate, with expanded long acute rays. 3. Elongate, stellate, projecting beyond the outer surface.

THENEA MURICATA.

Tethea muricata, Bowerb. ib. i. pp. 25, 108, f. 35, 304, 305.

Hab. Norway, Vigten Island.

4. AMNISCOS.

Sponge subglobose. Spicules:—1. Fusiform. 2. Stellate; stars subglobose; rays many, short, conical, broad at the base.

AMNISCOS MORUM.

Tethya morum, O. Schmidt, Sp. Ad. p. 44, t. 3. f. 26.

Hab. Corfu.

5. STELLETTA, O. Schmidt, Sp. Ad. p. 46; Suppl. i.

Sponge globular or subglobular. Spicules of three kinds:—1. Stellate; rays three to seven, slender. 2. Simple, fusiform. 3. Filiform, two- or three-hooked.

1. STELLETTA GRUBII, O. Schmidt, p. 46, t. 4. f. 2. B.M.

2. STELLETTA WAGLERI, O. Schmidt, p. 46, t. 4. f. 3. B.M.

3. STELLETTA BOGLICII, O. Schmidt, p. 47, t. 4. f. 4. B.M.

4. STELLETTA DORSIGERA, O. Schmidt, Supp. t. 3. f. 6, 7. B.M.

6. PENARES.

Sponge subglobular. Spicules:—1. Fusiform, smooth. 2. Stellate; rays few, slender. 3. Elongate, end three-rayed; rays elongate, bifid, diverging. Like *Irate*, but without any siliceous ovisacs.

PENARES HELLERI.

Stelletta helleri, O. Schmidt, Supp. i. t. 3. f. 8.

Hab. Adriatic.

7. ECIOMEMIA, Bowerb. B. S. i. p. 173.

Sponge branched. Spicules:—1. Elongate, filiform, two- or three-hooked at the distal end. 2. Stars very small, two- or four-rayed; rays cylindrical, blunt.

ECIOMEMIA ACERVUS, Bowerb. ib. i. p. 173, f. 355; O. Schmidt, Supp. ii. t. 1. f. 10 (stars).

See also—

? *Eciomemia compressa*, Bowerb. ib. ii. p. 57.

Eciomemia ponderosa, Bowerb. ib. p. 56.

8. DERCITUS.

Sponge massive, minutely hispid, flesh-like, dark purple. Spicules of three kinds:—1. Cylindrical, spined above, minute. 2. Stellate, three- or four-rayed; rays thick, diverging. 3. Tricurved, few in number.

DERCITUS BUCKLANDI.

Hymeniacidon bucklandi, Bowerb. ib. ii. p. 226, f. 43, 44.

Hab. British Channel.

** *Sponge without star-like spicules.*

9. *ANCORINA*, O. Schmidt, p. 51.

Sponge subglobose or lobed, without any star-like spicules. Spicules elongate, outer end two- or three-rayed, hooked, sometimes bifid.

1. *ANCORINA CREBRA*, O. Schmidt, p. 51, t. 3. f. 28.

2. *ANCORINA VIRESCENS*, O. Schmidt, p. 52, t. 3. f. 29.

II. *Sponge subglobose, with groups of triforked or tricurvate spicules extended beyond the surface, without any internal tricurvate or stellate spicules.*

10. *TETHYA*.

Sponge oval, hispid. Skin thin. Spicules of four kinds:—
1. Fusiform, elongate. 2. Fusiform, three-pronged, projecting beyond the surface. 3. Bihamate. 4. Clavate, with a short conical flat head, with a conical process on one side.

Tethea, § 1, Bowerb. B. S. p. 83.

Ancorina, Schmidt.

1. *TETHYA CRANIUM*, Lamk.

Tethya cranium, Johnston, B. S. p. 85, t. 1. f. 1-8; Bowerb. B. S. i. p. 183, ii. p. 83, f. 77-82, 247, 251, 252, 343, 344, 362; O. Schmidt, Supp. ii. t. 1. f. 14.

Alcyonium cranium, Müller, Z. D.

Spongia pilosa, Montag. B. S. p. 119, t. 13. f. 12.

B.M.

Hab. North Sea.

2. *TETHYA SIMILLIMA*, Bowerb. B. S. p. 725.

Hab. Arctic Regions.

III. *Sponge expanded; coating marine bodies with external spreading spicules with stellate tips.*

11. *MESAPOS*.

Sponge-coating hispid. Spicules:—1. Clavate, attenuated, large, slender. 2. Clavate, cylindrical, smooth; apex spinose, stellate.

MESAPOS STELLIFERA.

Hymeraphia stellifera, Bowerb. ib. ii. p. 146, f. 370.

12. *LAOTHOË*.

Sponge —? Spicules of three forms:—1. Fusiform, vertically spined. 2. Clavate, elongate, slender, smooth. 3. Needle-shaped, inflated, smooth; apex divided, substellate.

LAOTHOË VERTICILLATA.

Hymeraphia verticillata, Bowerb. ib. p. 145, f. 240.

13. TIMEA.

Sponge-coating thin, hispid. Skin spiculose. Spicules of four forms:—1. Cylindro-stellate, very minute in the skin. 2. Pin-shaped, large, long, fasciculated. 3. Needle-shaped. 4. Very slender, pin-shaped.

TIMEA STELLATA.

Hymedesmia stellata, Bowerb. B. S. ii. p. 150.

14. ACARNUS.

Sponge reticulate. Spicules:—1. Cylindrical, fasciculated. 2. Cylindrical, forming radiating groups, with stellate four-rayed ends; rays short, recurved.

ACARNUS INNOMINATUS.

Sponge, Bowerb. B. S. i. pp. 23, 33, 122, f. 292.

Hab. —?

15. FONTEIA.

Sponge —? Spicules of four kinds:—1. Subcylindrical, rather clavate at each end. 2. Cylindrical, with a pin-like head at each end. 3. Cylindrical, with a pin-like head at one end, and four short recurved hooks at the other. 4. Cylindrical, clavate at one end, and with four recurved hooks at the other.

FONTEIA ANOMALA, Bowerb. ib. f. 73–76.

Hab. —?

IV. *Sponge with stellate spicules in the skin or sarcode, without any internal or external tricurvate spicules.*

* *Sponge massive.*

16. PUMEX.

Sponge massive, subglobose, fleshy. Spicules:—1. Fusiform, slender, smooth. 2. Subulate, spinulose, tapering from the flat head. 3. Stellate, rays many, slender.

PUMEX ADRIATICUS.

B.M.

Tethya pumex, Nardo.

Stelletta pumex, O. Schmidt, Supp. i. t. 3. f. 9.

17. CORTICIUM, O. Schmidt, Sp. Ad. p. 42.

Sponge oblong, globose, smooth. Outer surface dense, fibrous; inner gelatinous, both spiculose. Spicules of two kinds:—1. Stellate, three- or four-rayed; rays slender. 2. Many-rayed, like a candelabrum.

CORTICIUM CANDELABRUM, O. Schmidt, p. 42, t. 3. f. 25; Supp. ii. t. 1. f. 2.

B.M.

18. *CHONDRILLA*, O. Schmidt, S. A. p. 39; Suppl. i. p. 36.

Sponge oblong or lobed. Outer surface formed of very closely compacted fibres. Spicules stellate.

CHONDRILLA EMBOLOPHORA, O. Schmidt, p. 39, t. 3. f. 23, 23*a*.
B.M.

CHONDRILLA NUCULA, O. Schmidt, p. 39, t. 3. f. 22, 22*a*. B.M.

** *Sponge branched.*

19. *STELLIGERA*.

Sponge branched, forked, flexible; surface stellate. Spicules united by a horny substance, netted, of four shapes:—1. Pin-shaped, smooth. 2. Needle-shaped, smooth. 3. Cylindrical, elongate, blunt at each end. 4. Spherical, stellate, with many acute rays (on surface).

STELLIGERA FURCATA.

Raspailia stelligera, O. Schmidt, p. 60, t. 5. f. 11.

20. *VIBULINUS*.

Sponge arborescent, branched, forked and reformed; surface spiculate. Spicules:—1. Fusiform, needle-shaped, long, slender, often fasciculated. 2. Stellate, spherical, or rather elongate, with numerous acute rays, minute.

VIBULINUS STUPOSUS.

B.M.

Spongia rigida, Montag.

S. stuposa, var. *damicenus*, Mont.

Halichondria rigida et *H. cervicornis*, Johnst.

Dictyocylindrus stuposus, Bowerb. B. S. i. p. 109, ii. p. 116, f. 208.

Hab. England.

See also—

V. aculeatus = *D. aculeatus*, Bowerb. ib. ii. p. 109.

21. *ADREUS*.

Sponge arborescent, branched; branches forked, smooth. Spicules abundant:—1. Needle-shaped, slender, often flexuous. 2. Needle-shaped, stout, in radiating bundles. 3. Stellate, minute in the sarcode.

ADREUS FASCICULARIS.

B.M.

Dictyocylindrus fascicularis, Bowerb. B. S. ii. p. 111.

Hab. English coast.

22. *AXOS*.

Sponge branching, reticulated. Spicules stellate, nearly uniform in size, formed of two flat three-rayed stars placed one on the other

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so that the rays alternate ; the rays flat, short, broad, truncated, with two, three, four, or rarely five subequal acute lobes at the ends.

AXOS CLIFTONII.

Sponge, Bowerb. B. S. i. p. 260, f. 197.

Hab. Australia, Nichol's Bay (*G. Clifton*).

See *Samus anonyma*, Bowerb. B. S. f. 41, 42, in *Clionidæ*.

23. ACHINOË.

Sponge — ? Spicules stellate, three-rayed ; rays much larger than the small central body, with one or more whorls of acute conical tubercles.

ACHINOË AUSTRALIS, Bowerb. B. S. i. p. 268, f. 235, 236.

Hab. West Australia, Freemantle.

See also Bowerbank's Brit. Sponges, f. 166. South Seas.

24. CYAMON.

Sponge — ?, spiculose. Spicules stellate, three- or four-rayed ; rays from a central point, cylindrical, blunt, minutely spined all over.

CYAMON VICKERSII.

Dictyocylindrus vickersii, Bowerb. B. S. i. p. 267, f. 234.

Hab. West Indies.

See also a parasitic sponge, Bowerb. ib. p. 242, f. 88.

25. SOLINA.

Sponge — ? Spicules stellate, three-rayed ; rays from a central point, elongate, cylindrical, blunt, with regular whorls of many small spines.

SOLINA ELEGANS, Bowerb. B. S. i. p. 241, f. 84.

Hab. Indian Ocean ?

26. ?EURYADES, Duchass. & Michelotti, Sp. Caraïbe, p. 106.

Sponge subglobose, lobed, horny, reticulated, with large concave central oscules. Spicules large, tricuspid, rays acute.

EURYADES NOTABILIS, Duchass. & Michel. ib. p. 206, t. 25. f. 3.

Hab. West Indies, St. Thomas's.

Order V. ARENOSPONGIA.

Sponge consisting of a disk of agglutinated sand, with a series of diverging spicules on the circumference of the disk, and a pencil of similar spicules at the mouth of the oscules on the upper surface of the disk.

Fam. XENOSPONGIADÆ.

XENOSPONGIA, Gray, P. Z. S. 1858, p. 230.

XENOSPONGIA PATELLIFORMIS, Gray, ib. Rad. pl. XII. B.M.

Hab. Torres Straits.

The genus *Halicnemia* (Bowerb. B. S. i. p. 184, t. 32. f. 363, 364, ii. t. 96) has the same form as the former. It has a small pebble imbedded in the centre; but, from the description and the figures, I have little doubt that it is distinct from the above, though it may belong to the same family. It contains many imbedded short pin-shaped spicules, and some oblong tubercular bodies like ovisacs (see f. 364). But there are many differences in detail that show it must be a very distinct genus; for example, the oscules are numerous on the lower, concave surface, the upper surface is covered with extraneous matter, and the lower one clear of such impurities.

Section II. CHLAMYDOSPORÆ. *Reproduction chiefly by ova contained in defined ova-cells or "ovaria," strengthened with siliceous spicules, sometimes at length becoming solid spheres formed of siliceous spicules radiating from a central point.*

Order VI. SPHÆROSPONGIA.

The ovisac cells composed of closely packed fusiform spicules diverging from the centre, which, when the ova are emitted, extend internally and fill up the cavity, forming the ova-cells into nearly solid balls, formed of spicules diverging from the centre to the circumference, which are congregated together, and form a hard external coat to the sponge.

Fam. 1. GEODIADÆ.

Sponge massive, fleshy, cellular within; pores with a regular constrictive valve. Ovisacs subglobose or oblong, with a thick coat formed of spicules in lines, radiating from the axis to the circumference, and at length becoming solid, congregated on the outer surface, or scattered in the flesh. Spicules elongate; the larger ones with two or three expanded or recurved branches on the outer ends; smaller ones simple, often extending beyond the surface.

I. *The ovisacs forming a thick external covering to the sponge.*

1. PACHYMATISMA, Bowerb. B. S. i. p. 171, ii. p. 51.

Sponge massive, irregular. Ovisacs forming a continuous external covering to the sponge. Spicules uniform, very slender; outer ends with two or three diverging branches.

PACHYMATISMA JOHNSTONIA, Bowerb. ib. ii. pp. 51, 172, f. 15, 16, 17, 20, 21, 45, 46, 93, 158, 159, 330, 331, 332, 353.

Halichondria johnstonii, Bowerb.

B.M.

2. *GEODIA*, Lamk. Ann. Mus. i. p. 334; Schweigger, Beob.

Sponge massive, with a central cavity covered with a netted or perforated lid. Spicules elongate, with two or three recurved branches at the outer end.

1. *GEODIA GIBBEROSA*, Lamk. Ann. Mus. p. 334; Blainv. Man. Act. p. 535, t. 91. f. 4; Duchass. & Michel. Sp. Car. p. 105, t. 26. f. 1.

G. tuberosa, Schweig. Beob. t. 11. f. 18, 19.

B.M.

Hab. West Indies.

2. *GEODIA CARIBEAE*, Duchass. & Michel. Sp. Car. p. 105, t. 25. f. 8.

Hab. West Indies.

3. *CYDONIUM*, Fleming, Brit. p. 516.

Geodia, sp., Johnst. B. S. p. 195; Bowerb. B. S. i. p. 168, ii. p. 45; O. Schmidt, S. A. Supp. ii. p. 11.

Sponge massive, without any central cavity, permeated by sinuous canals. Ovisacs forming an interrupted external covering to the sponge. Spicules of three forms:—1. Elongate, with two or three diverging branches at the outer end. 2. Stellate, minute. 3. Fusiform, subulate, slender, sometimes extending beyond the surface.

1. *CYDONIUM BARRETTI*.

Geodia barretti (*C. barretti*), Bowerb. B. S. i. pp. 171, 236, f. 54–58, 162, 250, 301, 302, 354.

Hab. Atlantic (*MacAndrew*).

B.M.

2. *CYDONIUM MUELLERI*?, Fleming, B. A. p. 516.

Aleyonium mülleri?, Jameson, Wern. Mem. i. p. 363.

Geodia zetlandica, Johnston, B. S. p. 193, t. 3. f. 3, 4; Bowerb. B. S. ii. p. 45.

Hab. North Sea.

B.M.

See also—

Geodia macandrewii, Bowerb. ib. i. p. 235, f. 47, 254, 325–329; O. Schmidt, Supp. ii. t. 1. f. 9.

G. ?carinata, Bowerb. ib. i. p. 239, f. 71, 163; Phil. Trans. 1858, p. 314, t. 36. f. 42.

G. placenta, O. Schmidt, p. 49, t. 4. f. 7.

G. gigas, O. Schmidt, p. 50, t. 4. f. 8, 9; Supp. ii. t. 1. f. 3. B.M.

G. tuberosa, O. Schmidt, p. 50, t. 4. f. 10.

G. conchilega, O. Schmidt, p. 51, t. 4. f. 11.

See also—

1. *TETHEA ROBUSTA*, Bowerb. B. Sp. i. pp. 51, 52, 231, f. 18, 160, 165, 167.

Hab. Australia (*Brit. Mus.*; *S. Stutchbury*).

Spicules:—1. Fusiform, with blunt ends. 2. Stellate, with small centre and long cylindrical blunt rays. 3. Stellate, spherical; body large; rays numerous, short, broad, conical; the rays often show a central line.

2. *TETHEA INGALLI*, Bowerb. ib. i. pp. 51, 52, f. 161, 164.

Hab. —.

Spicules stellate:—1. Rays few (seven or eight), cylindrical, blunt, larger than the small central body. 2. Rays far apart (eight or nine), conical, acute, about as long as the diameter of the central body.

II. *Ovisacs scattered in the flesh and outer surface of the sponge.*

4. *ERYLUS*.

Sponge expanded, mammillated, ending in an oscule. Spicules of three kinds:—1. stellate; 2. ternate, rays forked; 3. subcylindrical, waved. With oblong ovisacs, formed of claviform spines.

ERYLUS MAMMILLARIS.

Stelletta mammillaris, O. Schmidt, p. 48, t. 5. f. 1. B.M.

5. *TRIATE*.

Sponge irregular, tuberoso. Spicules of two kinds:—1. stellate; 2. ternate, with rays forked. Ovisacs roundish or elliptical, formed of claviform spines.

TRIATE DISCOPHORA.

Stelletta discophora, O. Schmidt, p. 47, t. 4. f. 5. B.M.
(See also Bowerb. B. S. f. 50, 51.)

6. *CAMINUS*.

Sponge globose, with a large single subcentral cavity. Bark netted. Spicules cylindrical, filiform, blunt at the end. Ovisacs oblong, elliptical.

CAMINUS VULCANI, O. Schmidt, p. 48, t. 3. f. 27, t. 4. f. 6.

Hab. Adriatic Sea. B.M.

Fam. 2. *PLACOSPONGIADÆ*.

Sponge branched, coral-like, with a central axis and a hard outer coat entirely formed of solidified ova. The axis and outer lamina separated from each other by a layer of sarcode, strengthened with bundles of spicules.

PLACOSPONGIA, Gray, P. Z. S. 1867.

PLACOSPONGIA MELOBESIOIDES, Gray, P. Z. S. 1867, p. 128 (cum fig.).

Hab. Borneo.

Order VII. POTAMOSPONGIA.

Ovisacs coriaceous, scattered in the tissue of the sponge, especially near the base. The cells coriaceous, with a permanent central cavity, strengthened externally with superficial spicules.

Fam. SPONGILLADÆ.

Sponge massive or branched. Skeleton formed of a network of spicula, more or less united together by horny matter; network symmetrical, four-sided.

Living in fresh water.—*Green*.

Spongilla, Lamk. A. s. Vert. ii. p. 98; Carter, Journ. Roy. Asiat. Soc. 1849, xii. p. 1.

Ephydatia, Lamx.; Gray, Brit. Plants, i. p. 353.

Tupha, Oken.

Badagia, Buxbaum in Sprengel, Syst. Veg. iv. p. 374.

- I. *The ovisacs thick, smooth, armed with birotate spicules, united by a central shaft, placed at right angles to and extending from the outer to the inner surface of the sac.*

1. EPHYDATIA.

Sponge-spicules fusiform, smooth. The disk of the ovisac-spicules entire or divided into lobes.

* *Disk of ovisac-spicules divided into lobes.*

1. EPHYDATIA FLUVIATILIS, Bowerb. B. S. f. 217, 218; P. Z. S. 1863, p. 7, t. 38. f. 1.

Hab. Europe.

B.M.

2. EPHYDATIA MEYENII, Carter, Asiatic. Soc. Journ. xii. p. 4, t. 1. f. 1; Bowerb. B. S. f. 219; P. Z. S. 1863, p. 10, t. 38. f. 4.

Hab. Bombay.

B.M.

** *Disk of ovisac-spicules entire.*

3. EPHYDATIA LEIDYI.

Spongilla leidy, Bowerb. P. Z. S. 1863, t. 38. f. 2 (disk of ovisac-spicules entire, smooth).

4. EPHYDATIA CAPEWELLI.

Spongilla capewelli, Bowerb. P. Z. S. 1863, t. 38. f. 2 (disk of spicules of ovisacs tubercular).

2. DOSILIA.

Sponge-spicules of two forms:—1. Fusiform, smooth. 2. Cylindrical, nodulose; central nodules extending beyond the stellate, and some spherical stellates with a group of recurved hooks at the ends of

the rays. Spicules of ovisacs birotate; rotulæ crenated; shaft spinose, often rudimentary.

1. DOSILIA PLUMOSA.

B.M.

Spongilla plumosa, Carter, *I. c.* xii. p. 5, t. 1. f. 2; Bowerb. B. S. f. 168-171, 208-212; P. Z. S. 1863, t. 38. f. 5.

Hab. Bombay.

2. DOSILIA BAILEYI.

Spongilla baileyi, Bowerb. P. Z. S. 1863, t. 38. f. 6.

Hab. United States, North America.

See also Bowerb. B. S. f. 241.

II. *The ovisacs tessellated on the surface, armed with fusiform spicules arranged parallel to and beneath the outer surface of the sac; disk with a central boss or imperfectly developed irregular subbirotate spicules on the inner surface of the sac.*

3. METANIA.

Sponge —? Spicules fusiform, smooth, curved. Outer spicules of ovisac like those of the skeleton, smooth or spinulose. Spicules of parietes birotate; shaft short, smooth, or spinose, stout; rotulæ equal, subequal, or very unequal.

* *Shaft of birotate spicula smooth.*

1. METANIA GREGARIA.

Spongilla gregaria, Bowerb. B. S. f. 206, 213-216; P. Z. S. 1863, t. 38. f. 7 (disk of ovisac-spines equal).

Hab. River Amazons.

2. METANIA PAULATA.

Spongilla paulata, Bowerb. B. S. f. 221, 222.

Hab. Brazil.

** *Shaft of birotate spicula spinose.*

3. METANIA RETICULATA.

Spongilla reticulata, Bowerb. *ib.* i. p. 38, f. 223, 322, 323; P. Z. S. 1863, t. 38. f. 9.

Hab. Brazil.

4. ACALLE.

Sponge-spicules fusiform, smooth. Ovisac-spicules of outer surface equibihamate, hooks four or five, recurved, large; of wall birotate, rotulæ very unequal, inner one rudimentary, shaft very slender.

ACALLE RECURVATA.

Spongilla recurvata, Bowerb. B. S. f. 129, 224, 225; P. Z. S. 1863, t. 38. f. 10.

Hab. River Amazons.

5. DRULIA.

Sponge-spicules fusiform, smooth. Ovisac-spicules of outer surface fusiform, smooth or spiculose; of inner surface discoidal, with an internal central umbo.

1. DRULIA BROWNII.

Spongilla brownii, Bowerb. B. S. i. p. 136, f. 202, 226, 227, 301a, b; P. Z. S. 1863, t. 38. f. 11.

Hab. River Amazons.

2. DRULIA BATESII.

Spongilla batesii, Bowerb. B. S. f. 204; P. Z. S. 1863, t. 38. f. 12.

3. DRULIA CORALLOIDES.

Spongia coralloides, Bowerb. B. S. f. 13.

Spongilla coralloides, Bowerb. P. Z. S. 1863, t. 38. f. 13.

III. *The ovisac covered externally with fusiform or cylindrical spicules, placed at right angles with the surface, and with spicules in lines radiating from the centre to the circumference of the ovisac, without any birotiform or discoidal rays.*

6. EUNAPIUS.

Sponge-spicules smooth. Ovisac with outer surface reticulated, areolated. Spicules fusiform, smooth.

1. EUNAPIUS CARTERI.

B.M.

Spongilla friutilis?, Carter, Journ. R. A. Soc. Bombay, 1849, p. 3, t. 1. f. 3.

Spongilla carteri, Bowerb. B. S. f. 201, 284.

Hab. Bombay.

2. EUNAPIUS PAUPERCULA.

Spongilla paupercula, Bowerb. P. Z. S. 1863, t. 38. f. 21.

7. SPONGILLA.

Sponge-spicules fusiform, smooth. Ovisacs externally spiculose, spicules fusiform, spinose or tubercular.

1. SPONGILLA LACUSTRIS, Bower. B. S. f. 90, 203, 249, 320; P. Z. S. 1863, t. 38. f. 14.

B.M.

Hab. Europe.

2. SPONGILLA CINEREA, Carter, *l. c.* p. 2, t. 1. f. 5; Bowerb. B. S. f. 205; P. Z. S. 1863, t. 38. f. 19. B.M.

Hab. India, Bombay.

3. SPONGILLA CEREBELLATA, Bowerb. P. Z. S. 1863, t. 38. f. 16.

Hab. East Indies.

4. SPONGILLA LORDII, Bowerb. P. Z. S. 1863, t. 38. f. 17.

Hab. Columbia River.

5. SPONGILLA ALBA, Carter, *l. c.* p. 4, t. 1. f. 4; Bowerb. B. S. f. 91, 207; P. Z. S. 1863, t. 38. f. 15. B.M.

Hab. Bombay.

6. SPONGILLA DAWSONI, Bowerb. P. Z. S. 1863, t. 38. f. 18.

Hab. Canada.

Mr. Carter has most kindly presented to the British Museum a series of the typical specimens of all the freshwater sponges of Bombay he described and figured.

8. DIPLODEMIA, Bowerb. B. S. i. p. 201, ii. p. 357; O. Schmidt, S. Ad. Supp. ii. p. 18.

Sponge massive. Skeleton irregularly netted; filaments compact, horny, solid, scattered, with single or groups of spicules diverging from the outer surface. Ovisacs ovoid, membranaceous; outer surface covered with dispersed and subfasciculate fusiform spicula.

DIPLODEMIA VESICULA, Bowerb. B. S. i. p. 201, ii. pp. 11, 357, f. 273, 324, 377.

Hab. Shetland. Perhaps a peculiar family.

Subclass 2. PORIFERA CALCAREA.

Skeleton composed of calcareous spicules, which are generally three-rayed, stellate.

Calcispongia, Blainv. Man. Act. p. 536.

Porifera leuconida, "Grant, Tabular View, 1861;" Bowerb. B. Sp. i. p. 154.

P. calcarea, Bowerb. ib. i. pp. 155, 160, 162.

Calcispongiæ, O. Schmidt, S. Ad.

Grantia, Fleming, Brit. An. p. 524; Johnston, B. Sp. (not Nardo).

Leucalia, Grant, Edin. Encyc. xviii. p. 844.

Oxyspongiæ imperforantes, Duchass. & Michel. Sp. Car. p. 110.

Nardo has a section of calcareous sponges; but it must not be confounded with this group. It is founded to contain two corals, allied to *Alcyonium* and *Gorgonia*, having no alliance with sponges.

Nardo gave the name of *Grantia* to a dendroid genus of fibrous sponges, of which *Spongia canabrina* of Esper is the type (see Isis, 1833, p. 522).

SYNOPSIS OF FAMILIES.

1. GRANTIADÆ. Sponge tubular or massive. Outer surface hispid, covered with three-rayed spicules.
2. ALCYONCELLIDÆ. Sponge tubular, simple or branched. Outer surface even, tessellated.
3. APHROCERASIDÆ. Sponge tubular, branched. Outer surface covered with fusiform spicules, arranged longitudinally, and internally reticulated.

Fam. 1. GRANTIADÆ.

Sponge tubular or massive, pierced with a tubular cloaca. Outer surface strengthened with three-rayed spicules.

* *Sponge tubular, isolated, or clustered.*

1. GRANTIA, Bowerb. B. Sp. i. p. 162.

Sponge tubular, fusiform, globular or bag-like, hispid. Oscules terminal, surrounded by a single series of cilia. Spicules triradiate; rays equiangular, elongate.

Grantia, sp., Fleming, B. A. (not Nardo).

Sycon, Lieberkühn, Arch. für Anat. 1860; O. Schmidt, S. Ad. p. 13; Supp. i. p. 22, 1862.

GRANTIA CILIATA, Fleming, B. A.; Johnston; Bowerb. B. S. p. 176, t. 20. f. 45, t. 21. f. 6, 7, 345, 346 a. B.M.

Spongia ciliata, Fab.

S. panicea, Esper, t. 18.

Grantia pulverulenta, Johnston, B. S. p. 180. B.M.

Spongia coronata, Ellis & Solander, Zooph. t. 58. f. 9.

Calcispongia ciliata et *C. pulverulenta*, Blainv. Man. Act.

Seypha coronata et *S. ovata*, Gray, B. Plants, i. p. 357.

Spongia inflata, Delle Chiaje, iii. t. 37. f. 16, 17.

Sycon ciliata, O. Schmidt, Sp. Ad. p. 14, t. 1. f. 1 a.

Lieberkuhnea ciliata, O. Schmidt.

See also—

Grantia asperum (*Sycon asperum*), O. Schmidt, Sp. Ad. p. 15, t. 1. f. 4, 4 a; Supp. ii. t. 1. f. 5. B.M.

G. humboldtii (*Sycon humboldtii*), O. Schmidt.

G. raphanus (*S. raphanus*), O. Schmidt.

G. setosa (*S. setosus*), O. Schmidt.

2. UTE, O. Schmidt, S. A. p. 16; Supp. p. 23.

Sponge tubular, solitary, sac-shaped or fusiform, more or less peniculated. Oscules terminal, not crowned with a series of cilia.

1. UTE CAPILLOSA, O. Schmidt, S. Ad. p. 17, t. 1. f. 6.

Ute glabra, O. Schmidt, Supp. i. p. 23, t. 3. f. 1.

2. UTE ENSATA.

Grantia ensata, Bowerb. B. S. i. pp. 29, 241, t. 4. f. 85, ii. p. 25.

See also—

Ute chrysalis, O. Schmidt, Supp. i. p. 23, t. 3. f. 2.

Sycon (Ute) papillosum, O. Schmidt.

** *Sponge tubular, with one or many terminal oscules.*

3. ARTYNES.

Sponge tubular, compressed, simple or lobed above, with an oscule terminating each lobe. Surface even. Mouth of oscule without cilia. Spicules of outer surface clavate, bent. Skeleton three-rayed.

ARTYNES COMPRESSA.

B.M.

Grantia compressa, Johnston, B. S. p. 174, t. 20. f. 1; Bowerb. B. S. i. p. 162, ii. p. 17, f. 38, 39, f. 312–314, f. 346*b*.

Calcispongia compressa, Blainv.

Spongia foliacea, et *S. compressa*, Mont. Trans. Wern. Soc. p. 2, t. 12.

Scypha foliacea, Gray, Br. Plants, i. p. 358.

*** *Sponge massive, with a tubular cloaca.*

4. LEUCOSOLENIA, Bowerb. B. S. i. p. 164; O. Schmidt, S. A. Supp. ii. p. 8.

Sponge tubular, formed of a single layer of triradiate and other spicula.

Nardoa, et *Grantia*, O. Schmidt, p. 41.

† *Arborescent.*

1. LEUCOSOLENIA BOTRYOIDES, Bowerb. B. S. i. p. 164. B.M.

Spongia botryoides, Ellis & Solander.

Grantia botryoides, Fleming; Johnst. B. S. p. 178, t. 21. f. 1–5.

G. lieberkuhnii, O. Schmidt.

Calcispongia botryoides, Blainv.

Spongia complicata, Mont.

Scypha botryoides, Gray.

S. confervicola, Templeton.

See also—

Grantia clathrus, O. Schmidt, Supp. p. 24, t. 3.

†† *Massive.* *Nardoa*.

2. LEUCOSOLENIA CONTORTA, Bowerb. B. S. ii. p. 29.

3. LEUCOSOLENIA LACUNOSA, Bowerb. ib. ii. p. 32.

Grantia lacunosa, Johnston, B. S. p. 176, t. 20. f. 23.

Nardoa lacunosa, O. Schmidt, Supp. p. 41.

††† *Incrusting spicula minute.*

4. LEUCOSOLENIA CORIACEA, Bowerb. B. S. ii. p. 34.

Spongia coriacea, Mont.*Grantia coriacea*, Johnston, B. S. p. 183, t. 21. f. 9.*G. multicava*, Bean.

See also—

Leucosolenia pulchra, O. Schmidt.*Grantia striatula*, Bowerb. B. S. i. p. 233, f. 38, 39.*G.* —?, Bowerb. ib. i. p. 245, f. 100.*Hab.* Australia (*Harvey*). Sponge minute, $\frac{1}{8}$ inch only.*G.* —?, Bowerb. ib. i. p. 245, f. 101.*Hab.* Algoa Bay. Size of a large pea.*G.* —?, Bowerb. ib. i. p. 268, f. 237.*Hab.* West Australia, Freemantle.

5. LEUCONIA, Grant.

Sponge massive, permeated by sinuous canals, strengthened with irregularly placed triradiate and other spicula.

Leuconia, Bowerb. B. S. i. p. 164, ii. p. 32; O. Schmidt, S. Ad. Supp. ii. p. 3.

Medon, Duchass. & Michel. S. Car. iii. p. 186.

1. LEUCONIA NIVEA, Bowerb. B. S. ii. p. 36.

B.M.

Spongia nivea, Grant, New Edin. Phil. Journ. i. p. 168, t. 2. f. 14–16.

Grantia nivea, Fleming; Johnston, B. S. p. 182, t. 21. f. 8.

Calcispongia nivea, Blainv.

Grantia solida, O. Schmidt, S. Ad.

Hab. Coast of England.

2. LEUCONIA FISTULOSA, Bowerb. B. S. ii. p. 39.

Grantia fistulosa, Johnston, B. S. p. 191, t. 20. f. 7.

Hab. South coast of England.

3. LEUCONIA PUMILA, Bowerb. B. S. ii. p. 41.

Hab. Guernsey (*Norman*).

See—

Medon imberbis, Duchass. & Michel. S. Car. p. 111, t. 25. f. 2.

Hab. West Indies.

Medon, sp., Duchass. & Michel. S. Car. p. 111, t. 25. f. 9, 10.

Hab. West Indies.

6. LEUCOGYPSIA, Bowerb. B. S. i. p. 165, ii. p. 2; O. Schmidt,
l. c. p. 8.

Sponge massive, with oscules on outer surface and no cloaca, formed of irregularly disposed membranes and spicula.

1. *LEUCOGYPSIA GOSSEI*, Bowerb. ib. ii. p. 12.

Hab. South coast of England.

2. *LEUCOGYPSIA ALGOENSIS*, Bowerb. ib. ii. p. 166, t. 26. f. 345, 350 (spicula).

Hab. Algoa Bay.

7. CLATHRINA.

Sponge branched; branches slightly compressed, variously and irregularly anastomosing. Oscules at the end of the smaller branches. Spicules triradiate, rays blunt.

CLATHRINA SULPHUREA.

B.M.

Grantia clathrus, O. Schmidt, S. A. Supp. i. p. 24, t. 3. f. 3.

8. LELAPIA.

Sponge —? Spicules calcareous, elongate, fusiform, with two more or less elongated nearly parallel branches at one end.

LELAPIA AUSTRALIS.

A new calcareous sponge, Bowerb. B. S. i. f. 237.

Hab. West Australia, Freemantle.

Fam. 2. ALCYONCELLIDÆ.

Sponge tubular, simple or branched. Outer surface tessellated, formed of square perforated cells. Oscules terminal.

1. ALCYONCELLUM.

Sponge soft, subgelatinous, slightly branched.

Alcyoncellum et *Alcyoncella*, Blainville, Man. d'Actin. p. 529, 1832 (not Milne-Edwards, 1835; Bowerbank, nor Owen, Nardo, nor O. Schmidt).

ALCYONCELLUM GELATINOSUM, Blainv. Man. d'Actin. p. 529, t. 92. f. 5.

Hab. —.

B.M.?

2. DUNSTERVILLIA, Bowerb.; O. Schmidt, S. Ad. p. 6.

Sponge tubular, fusiform or globose, hispid. Surface even, tessellated. Oscules single, terminal, surrounded with two series of cilia—one vertical, and the other expanded horizontally. Spicules of skeleton three-rayed, rays equal; of fringe rigid, fusiform.

1. DUNSTERVILLIA TESSELLATA.

Grantia tessellata, Bowerb. B. S. i. pp. 29, 275, t. 4. f. 86, 286, ii. p. 26.

With the internal defensive spicules (clavate) curved towards the mouth of the cloaca.

2. *DUNSTERVILLIA CORCYNENSIS*, O. Schmidt, S. Ad. p. 16, t. 1. f. 5; Supp. ii. t. 1. f. 6.

Fam. 3. APHROCERASIDÆ.

Sponge tubular, branched, formed of two coats; outer coat of simple fusiform spicula, placed side by side in the longitudinal axis of the stem and branches. Inner coat and network of interlaced fibres, placed in all directions. Branches simple, attenuated and open at the tip.

APHROCERAS, Gray, P. Z. S. 1858, p. 113.

APHROCERAS ALCICORNIS, Gray, ib. p. 114, Rad. pl. x. f. 1, 2.
Hab. Hong Kong (*Dr. Harland*). B.M.

DESCRIPTION OF PLATES XXVII. & XXVIII.

PLATE XXVII.

- Fig. 1. *Dactylocalyx subglobosa* (p. 506), of the natural size. From a specimen in the British Museum.
 2. *Dactylocalyx pumicea* (p. 506), one-eighth of the natural size. From a specimen in the British Museum.

PLATE XXVIII.

- Fig. 1. *Corbitella speciosa*, p. 530.
 2. *Heterotella corbieula*, p. 531.
 (Both from photographs of specimens in the Museum of Paris.)

7. On some New or imperfectly known Fishes of Madras.
 By FRANCIS DAY, F.Z.S., F.L.S., Madras Army.

The following descriptions refer to seven species of fish personally obtained in the Madras Presidency during the last few months. The freshwater ones are from the Toomboodra at Kurnool, the saltwater ones from Madras. They appear to be either new to science or imperfectly known, as none find a place in Dr. Günther's elaborate 'Catalogue of Fishes,' except where they are mentioned in notes without a description, and with the synonymy only, as "species either insufficiently described, or founded on characters so slight that it is doubtful if they will stand as species." Sykes's *Pimelodus gogra* seems to form the type of a new genus, which I have designated *Gogrius*.

LETHRINUS KARWA, Cuv. & Val.

B. vi. D. 10/9. P. 13. V. 1/5. A. 3/8. C. 17. L. 1. 46.
 L. tr. 5/16.

Length of specimen 15 inches.

Length of head $\frac{4}{15}$, of pectoral above $\frac{1}{4}$, of caudal $\frac{1}{6}$, of base of dorsal nearly $\frac{1}{5}$, of base of anal $\frac{1}{6}$ of the total length. Height of

head $\frac{1}{3}$, of body $\frac{1}{3}$, of hard dorsal $\frac{1}{10}$, of ventral $\frac{1}{8}$, of anal $\frac{1}{12}$ of the total length.

Eyes circular; diameter $\frac{2}{9}$ of length of head, $1\frac{1}{4}$ diameter apart, $2\frac{1}{4}$ diameters from end of snout.

Jaws of equal length. Cleft of mouth extends two-thirds the distance to beneath the anterior margin of the orbit. Preopercle entire; posterior limb nearly vertical and slightly emarginate, angle rounded. Opercle with two very dull points. Sub- and interopercles entire. Five rows of scales on the opercle, none on the cheeks.

Teeth. Anteriorly in both jaws some canines, with several rows of conical ones posterior to them, and molars with rounded crowns in the posterior part of the jaws. No teeth on vomer or palate.

Fins. Dorsal spines moderately strong, extending over three-fifths of the base of the fin; third and fourth spines the longest; a fleshy sheath, thickest posteriorly, runs along the base of the fin. Third anal spine the longest. Caudal lunated.

Colours. Olivaceous brown, becoming lighter on the abdomen; the centre of each scale having a cerulean-blue spot, which, reaching almost across it, forms blue lines in the direction taken by the rows of the scales. Pectoral flesh-coloured, with the base of the second, a wide undivided ray, of bright blue. Ventral bluish slate-colour. Dorsal and anal slate-coloured, margined with orange. Caudal bluish. Eyes golden. The whole of the inside of the mouth and fauces bright orange.

Hab. Madras.

SERIOICHTHYS LINEOLATUS, sp. nov.

B. vii. D. $6\frac{1}{24}$ | II. P. 21. V. $1\frac{1}{5}$. A. $\frac{1}{16}$ | II. C. 16. L. 1.
96. L. tr. $16\frac{2}{28}$.

Length of specimens $11\frac{5}{10}$ inches.

Length of head $\frac{1}{3}$, of base of first dorsal $\frac{1}{11}$, of base of second dorsal $\frac{1}{3}$, of pectoral $\frac{1}{3}$, of base of anal $\frac{2}{11}$, of caudal $\frac{1}{4}$ of the total length. Height of head $\frac{1}{7}$, of body $\frac{1}{5}$, of dorsal spines $\frac{1}{33}$, of dorsal rays $\frac{1}{33}$, of ventral $\frac{1}{9}$, of anal rays $\frac{1}{7}$ of the total length.

Eyes. Transverse diameter slightly the longest, upper margin close to the profile; a narrow adipose lid along either side of the eye. Diameter $\frac{1}{4}$ of length of head, 1 diameter apart, $1\frac{1}{4}$ diameter from end of snout.

Body elongated and compressed, its greatest height being opposite the origin of the soft dorsal.

Head compressed; snout rather produced. Gape of mouth slightly narrow; posterior margin of upper jaw reaches to below the anterior margin of the orbit, and is partially hidden by the preorbital, which has some elevated stellated ridges along its upper portion. A rather high central longitudinal crest along the summit of the head, and a smaller one passing backwards and slightly inwards from before the anterior margin of the orbit. Nostrils midway between orbit and end of the snout. Vertical limb of præoperculum entire and directed

slightly backwards; angle rounded; horizontal limb *entire*. Gill-opening cleft to beneath the anterior margin of the orbit.

Fins. Pectoral commences opposite to the summit of the suboperculum; ventral under the lower insertion of the root of the pectoral; first dorsal over the posterior third of the pectoral, and terminating close to the second dorsal. Anal, which has *no free spines anterior to it*, commences under about the thirteenth dorsal ray. Dorsal spines low, not strong, membrane deeply emarginate; spine of second dorsal weak, the anterior portion of the fin the highest, its posterior two-thirds being low and parallel to the back, divided by a short interspace from two free rays, which are placed close together, the last being elongated and reaching the root of the caudal. Pectoral longest superiorly. Ventral pointed, and without any groove along its base. Form of anal and the free rays posterior to it of the same character as the dorsal. Caudal deeply lobed in its posterior three-fourths.

Scales over body, upper surface of opercles, and cheeks; a slight groove along the second dorsal and anal fins.

Lateral line passes straight to opposite the commencement of the second dorsal, then slightly descends, and from opposite the origin of the anal proceeds direct to the centre of the caudal, on which it is continued without any elevation to its end.

Colours. Back deep slate-colour; abdomen white. A deep-blue line runs from the eye to the posterior margin of the dorsal fin above the tail, a second from the inferior margin of the orbit to the centre of the caudal fin. Between these lines the colour is of a dull yellow; below the inferior blue line at first yellowish, then gradually shaded from bluish to white. Caudal yellowish green. Anal yellowish. Pectoral slate-coloured, tipped with yellow. Dorsal darkish. Eyes golden. Lips blue.

Two specimens were captured in March 1867, both of which differed from the *S. bipinnulatus*, more especially in having one ray less in the dorsal fin, in there being no free spines before the anal, and in the præoperculum being entire.

Hab. Madras, where it is said to attain 2 feet in length.

COSSYPHUS NEILLI, sp. nov.

B. vi. D. 12/10. P. 16. V. 1/5. A. 3/12. C. 14. L. l. 34. L. tr. 5/12.

Length of specimens $7\frac{5}{10}$ inches.

Length of head $\frac{3}{8}$, of pectoral $\frac{1}{6}$, of base of hard dorsal a little above $\frac{1}{8}$, of base of soft dorsal $\frac{1}{8}$, of base of anal $\frac{1}{6}$, of caudal $\frac{1}{8}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{2}{3}$, of hard dorsal $\frac{1}{11}$, of soft dorsal $\frac{1}{11}$, of ventral, including prolonged rays, $\frac{1}{6}$, of anal spines $\frac{1}{9}$, of anal rays $\frac{1}{8}$ of the total length.

Eyes. Upper margin not far from the profile. Diameter $\frac{2}{3}$ of length of head, 1 diameter apart, $1\frac{1}{3}$ diameter from end of snout.

Body rather elongated; snout produced; the dorsal profile slightly more convex than that of the abdomen.

Mouth anterior, the posterior extremity of the upper jaw reaching to under the anterior margin of the orbit, but almost concealed by the preorbital and thick fleshy upper lip, which has a broad fold anteriorly. Posterior limb of the præoperculum nearly vertical, but becoming slightly oblique towards its angle, and the whole very finely serrated; lower limb horizontal, entire. Operculum spineless, rather higher than wide; sub- and interopercula entire.

Teeth. Four strong canines in the anterior part of either jaw, the outer ones in the upper jaw curved outwards, as are also those of the lower jaw, but to a less extent; a single row of pointed teeth along the side of either jaw, and a posterior canine.

Fins. The dorsal spines anteriorly weak, the last being longest and strongest and equal in length to the rays; the interspinous membrane extended beyond the spines and deeply notched. Pectoral rather pointed. Ventral with its first ray prolonged; its spine weak and nearly equal in length to the last dorsal one. First anal spine weak, half the length of the second, which is about equal in strength to, but not so long as, the third. Caudal with a broad base, and slightly emarginate.

Scales cycloid, placed in horizontal rows along the body; those on the head smaller, and covering the interorbital space, the cheeks, and opercula, but not the preorbital; also forming a sheath to the dorsal and anal fins, and extended over the base of the caudal.

Lateral line composed of scales smaller than those contiguous, consisting of a single tube on each scale branching posteriorly. It is continuous in upper third of the body from the head to the centre of the caudal fin.

Colours. Scarlet, extended over the whole of the body without any dark markings. Anal yellow, its central rays scarlet; the dorsal red, with its last few rays yellow, its sheath also yellowish. Caudal red. Pectoral flesh-coloured. Lips reddish. Eyes golden, with red markings.

I have named this species after my esteemed correspondent A. G. Brisbane Neill, Esq., F.Z.S.

Hab. Madras.

PLAGUSIA POTOUS, Cuv.; Russell, pl. 73.

B. vi. D. 107. V. 6. A. 87. C. 12. L. 1. 87.

Length of head $\frac{2}{3}$ of the total length. Height of body $\frac{1}{4}$ of the total length.

Eyes on the left or coloured side, half of the superior being in advance of the inferior, and the posterior margin of the lower orbit being in the centre of the length of the head; diameter $\frac{1}{11}$ of length of head; 1 diameter apart.

Body elongated and lanceolate. Mouth cleft to slightly beyond the posterior extremity of the lower orbit, its angle midway between snout and gill-opening. The elongated hook of the snout ends below a vertical line from the anterior extremity of the upper orbit.

Fins. Dorsal commences the length of two diameters of the orbit

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before the superior one, the eighth ray being over the centre of the upper orbit. The anal arises under the posterior extremity of the opercle; both fins are joined to, but not amalgamated with, a pointed caudal, the points of the rays project slightly beyond the membrane.

Scales ctenoid, decreasing in size from the centre to the side of the body. Those on the right side of the body larger than those on the left.

Lateral line commences just above the opening of the mouth, and skirts the snout, becoming divided into three; the superior is continued along the upper seventh of the body to its termination at the base of the caudal; the central one, passing above the eyes, goes straight along the centre of the body to the middle of the base of the caudal, whilst the inferior passes to between the orbits. The middle line gives a second branch over the nape to join the superior one, and slightly anterior to it another short descending one. Another line passes along the lower jaw, and ends at the extremity of the operculum, becoming convex *en route*. The central lateral line is on scales smaller than those around it.

Colours. Darkish brown on the coloured side, yellowish white on the blind side. Dorsal, anal, and caudal fins with a white edging.

Hab. Common in Madras.

SYNAPTURA JERREUS, Cuv.

Jerre potoo, B. Russell, pl. 71.

B. vi. D. 65-68. P. 10. V. 6. A. 56. C. 16. L. 1. 96.
L. tr. 25/31.

Length of specimens from 4 to $5\frac{6}{10}$ inches.

Length of head $\frac{1}{7}$ of the total length. Height of head $\frac{1}{5}$, of body $\frac{1}{3}$ of the total length.

Eyes close together, the anterior third of the superior one being in front of the inferior one, whilst the distance from the end of the snout equals its diameter.

Cleft of mouth narrow, twisted round to the left side. Nostrils on the coloured or right side tubular, but not so on the left.

Teeth in jaws minute on the blind side.

Fins. Dorsal commences opposite the anterior extremity of the upper orbit; it is continuous with the caudal, and also with the anal. Occasionally the first dorsal ray is thickened and prolonged. Pectoral short, close to the gill-opening, and of equal length on both sides, equal to about the diameter of the orbit.

Scales strongly ctenoid.

Lateral line passes direct from the posterior border of the opercle to the centre of the caudal.

Colours. Of a greyish brown, with rich reddish-brown vertical bands, commencing at the summit of the dorsal and extending to the inferior margin of the anal fin-rays, on which they become nearly black. From ten to eleven exist on the body, and two pass down the head. Pectoral on the coloured side black. Caudal black, with some irregular white markings towards its side and extremity. In

some specimens there are three bands on the head, and those in the anterior part of the body divide into two at their lower halves.

Hab. Madras.

Genus GOGRIUS.

Branchiostegals seven. Opercular bones with moveable articulations. Bones on summit of head granulated and covered with thin skin. Mouth wide, anterior; upper jaw mostly the longest. Two pairs of cirri, the maxillary thin, the mandibular wide apart. Nostrils approximating, the posterior provided with a valve. Eyes not covered by skin. Teeth in jaws slightly villiform anteriorly, but posteriorly molars with more or less large rounded crowns; on the palate also molars with globular crowns, placed in two widely separated patches, converging anteriorly. Two dorsals: the first with a strong serrated spine and seven rays, and placed before the ventral; second dorsal adipose and small. Pectoral spine strong, serrated on both edges. Caudal forked. Air-bladder present.

GOGRIUS SYKESII.

Pimelodus gogra, Sykes.

B. viii. D. $\frac{1}{6}$ | 0. P. 1/9. V. 6. A. 12. C. 17.

Length of head $\frac{1}{4}$, of pectoral $\frac{1}{5}$, of base of first dorsal $\frac{1}{9}$, of base of adipose dorsal $\frac{1}{9}$, of base of anal $\frac{1}{12}$, of caudal $\frac{1}{6}$ of the total length. Height of head $\frac{1}{7}$, of body $\frac{1}{5}$, of first dorsal $\frac{1}{5}$, of adipose dorsal $\frac{1}{14}$, of ventral $\frac{1}{7}$, of anal $\frac{1}{7}$ of the total length.

Eye. Situated slightly above the level of the cleft of the mouth, directed rather upwards and outwards, transversely oval, and its transverse diameter $\frac{2}{3}$ of length of head; eyes $1\frac{1}{2}$ transverse diameter apart, $1\frac{1}{3}$ from end of snout.

Body stout; cheeks puffed out. The dorsal profile more convex than that of the abdomen, which last is almost straight. There is a considerable rise from the snout to the commencement of the dorsal fin.

Summit of head rather compressed, whilst the snout appears to be slightly produced, and the upper jaw the longest. Gape of mouth wide, and equal to twice the extent of the cleft, which last does not reach to beneath the anterior margin of the orbit. Snout rather pointed. The intermaxillaries do not extend the whole width of the gape. A shallow longitudinal groove exists between the orbits, only extending one-third of the distance to the base of the occipital process, which is roughened and of equal width, which is scarcely equal to half its length, whilst it embraces the basal bone of the dorsal fin, which is roughened and of a V-shape. Nostrils midway between orbits and end of snout; they approximate, and are not furnished with a cirrus. Maxillary cirrus thin and extending to the base of the pectoral fin. Mandibular cirrus wide apart from that on the opposite side, commencing under the vertical from the anterior margin of the orbit, and reaching to beneath the root of the pectoral fin. Branchial membranes of the two sides coalesce in a wide band of skin, which is not confluent with that of the isthmus.

Teeth. In intermaxillaries villiform; in lower jaw also villiform, anteriorly in several rows, having posterior to them some with globular crowns, whilst all along the sides of the jaws are of this last description, increasing in size posteriorly, where they play against those of the palate, which are in one large patch converging anteriorly, whilst all have globular crowns.

Fins. The whole of the dorsal is placed anterior to the ventral, which last does not extend to the commencement of the anal, over which last is the adipose dorsal. Dorsal fin rather highest anteriorly, its spine two-thirds of length of head, and ending in a soft point; it is strong, smooth, excepting posteriorly, where it is slightly serrated. The pectoral, which commences under the opercle, has a very strong, flat spine, a little longer than that of the dorsal; it is armed with strong denticulations on both sides, which are largest internally, where they are directed anteriorly, whilst the external ones are directed posteriorly; it has a soft termination. Anal highest in its centre, and its rays weak. Caudal lobed in its last half, both of which are pointed.

Lateral line at first curves slightly downwards, then makes a curve upwards opposite the ventral, and from the centre of the body proceeds direct to the caudal.

Colours. When first captured, of a canary-colour with dusky fins; having been some time out of the water it becomes of a dull brownish yellow, and after soaking some time in spirits almost all the yellow disappears; it seems due to mucus with which the fish is covered.

Hab. Kurnool and the Deccan.

EUTROPIUS TAAKREE, Sykes.

B. vi. D. $\frac{1}{6-7}$ | 0. P. 1/8. V. 6. A. 3/43. C. 18.

Length of head $\frac{1}{6}$, of pectoral $\frac{1}{6}$, of caudal $\frac{2}{11}$, of base of dorsal $\frac{1}{20}$, of base of anal $\frac{1}{3}$ of the total length. Height of head $\frac{1}{8}$, of body $\frac{2}{11}$, of dorsal $\frac{1}{7}$, of ventral $\frac{1}{6}$, of anal $\frac{1}{12}$ of the entire length.

Eye. Diameter $\frac{1}{4}$ of length of head, nearly 2 diameters apart, $1\frac{1}{3}$ diameter from end of snout. They are so situated that more of the eye is to be seen from the under than the upper surface of the head, being directed outwards and partly downwards.

Body elongated and compressed, highest opposite the dorsal fin. Profile of upper surface of the head a little concave, owing to a slight elevation of the snout and another rise at the occiput. Abdominal profile more convex than that of the back.

Gape of mouth moderately wide, its cleft rather concave, owing to there being an elevation at the symphysis. Lower jaw slightly the longest in adults. Occipital process long and slender, having an intermediate bone between it and the basal bone of the dorsal fin, the two forming the occipital process being five times as long as wide. Central longitudinal groove shallow, commencing rather behind the posterior extremity of the orbits, and continued, though but little apparent, to the base of the occipital process. Nostrils transversely oval, situated at a short distance (equal to their diameter) apart;

the anterior one on the front surface of the snout just internal to the root of the maxillary cirrus, divided from the posterior by the nasal cirrus; the posterior nostril rather more than one diameter from the median line of the skull. Nasal cirri thin, extending to opposite the posterior margin of the orbit; the maxillary reaching to the commencement of the base of the anal fin; the two pairs of labial cirri arise close together, the root of the internal one slightly in front of that of the external one, and both nearly under the symphysis, whilst they reach to the first third of the pectoral fin.

Teeth in both jaws in numerous fine rows; those in the vomer and palatine bones separated by a very short interspace in the central line, and each of these again divided into two separate patches of an almost oval form, so that their inner margin has three emarginations.

Fins. Dorsal commences opposite the centre of the pectoral. Ventral under the posterior third of the dorsal. Adipose dorsal over about the thirty-second anal ray. First dorsal pointed; its spine sharp, strong, rugose anteriorly, and serrated posteriorly in its upper two-thirds, whilst it has a soft termination. Pectoral spine strong, finely serrated internally, whilst it is one-fourth longer than the dorsal spine. Ventral small, and extending as far as the anus. Caudal deeply forked, with pointed lobes.

Lateral line nearly straight, dividing into two at the root of the caudal fin.

Air-bladder large, simple.

Colours. Silvery, with a gloss of green along the back and head. Caudal stained rather darkish. All the other fins diaphanous.

Grows to upwards of $1\frac{1}{2}$ foot in length, and is good eating.

Hab. Kurnool and the rivers of the Deccan.

May 23, 1867.

Dr. J. E. Gray, F.R.S., V.P., in the Chair.

Mr. E. Blyth, C.M.Z.S., exhibited a series of drawings of the horns of various Indo-Chinese species of Deer (*Cervus duvauceli*, *C. schomburgki*, &c.).

Mr. Blyth also exhibited two specimens of Crows from a collection of skins sent from Australia, evidently of two different species, one being considerably larger than the other, and differing in some other particulars. The smaller kind was stated to be that figured in Mr. Gould's 'Birds of Australia,' vol. iv. pl. 18, as *C. coronoides*, Gould, where the figure is stated to be of the natural size; but the specimen exhibited had a longer wing, measuring 12 inches from the carpus, and the lanceolate feathers of the front of the neck were considerably less strongly developed than in Mr. Gould's representation of the species.